

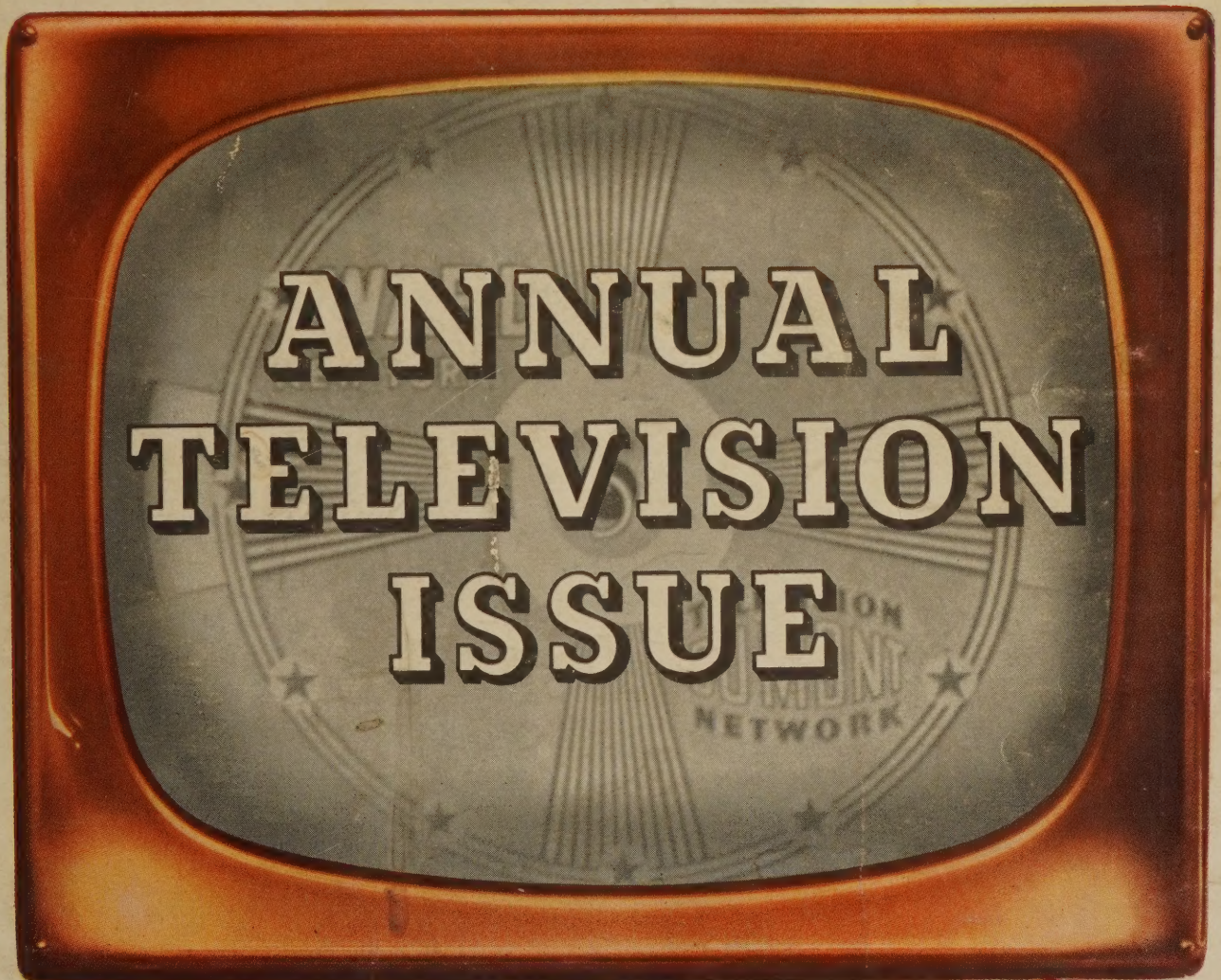
**6th ANNUAL TELEVISION NUMBER**

**JANUARY 1953**

# **RADIO — ELECTRONICS**

**LATEST IN TELEVISION • SERVICING • AUDIO**

**HUGO GERNSBACH, Editor**



***In this Issue:***

**Articles by Guy, Rider, Tilton •  
Directories and listings of:  
TV Receivers, Boosters, Antennas  
Components, Kinescopes, Channels •  
U. H. F. Articles and Circuitry •**

**50¢**

**U. S. and  
CANADA**





# DO IT RIGHT- DO IT WITH DU MONT



**FREE!**

**YOUR COPY OF  
DU MONT**

**Service News**  
PUBLICATION OF THE TELESET SERVICE CONTROL DEPARTMENT  
ALLEN B. DU MONT LABORATORIES, INC., PATERSON, N. J.

**HERE!**

**at your jobber!**

THE SERVICE NEWS, authoritative publication of Du Mont Teleset Service Control, gives you each month service techniques as they are tested... production changes as they happen!

With the *right information*, minutes may save hours of troubleshooting. With the *right parts*, repair is simplified... service is better... customer satisfaction builds confidence and reputation.

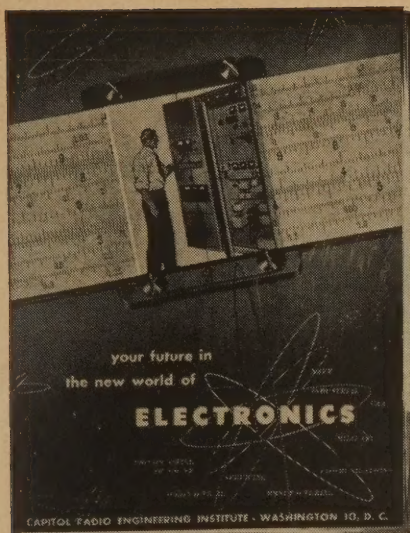
Both are at your local Du Mont Distributor. Look for the Du Mont SERVICE NEWS on your next call... and insist on ORIGINAL TELEVISION PARTS.

\*TRADE MARK



REPLACEMENT SALES, CATHODE-RAY TUBE DIVISION, ALLEN B. DU MONT LABORATORIES, INC., CLIFTON, N. J.





# How far ahead can you be next year . . . IN TV AND ELECTRONICS?

◀ Send for this free CREI booklet today . . .  
and find out!

**T**HIS BOOKLET can mean the difference between small, w-i-d-e-l-y s-p-a-c-e-d salary increases—and rapid advancement. Between routine work—and challenging opportunity. Between constantly defending your job against better-trained men—and dynamic confidence. Between short-circuited hopes—and high-powered ambition.

An exciting new world has opened up with such super-speed that even the most optimistic electronic experts fall short in their predictions of expansion.

Think of the 113 TV stations now on the air and the 2,500 stations made possible by the FCC unfreeze. Think of the over 18,000,000 TV sets now in use. That's 5,000,000 more than we were supposed to have by 1954. Think of the 100,000,000 radios in current operation. (95% of the nation's homes have one or more sets.) Think of the tremendous defense orders now being placed for electronic equipment and installations.

Think of the thousands of radio-equipped fire and police departments throughout the U.S. Of the many radio-equipped railroads, of the hundreds of cities with 2-way radio service for cars and cabs. Think of the wide-ranging field of aviation communications—radio-controlled aircraft, navigation-and-traffic control, airport stations.

Think of the maritime world with its navigational aids, fathometers, ship-to-shore and ship-to-ship communications and radar. Think of electronic heating, fax and ultra-fax, of electronic medicine, and all the other applications of electronic know-how.

Countless positions must be filled—in development, research, design, production, testing and inspection, manufacture, broadcasting, telecasting and servicing. Who will get those positions? You—if you prepare today—if you are alert and have the ambition to advance your knowledge. You—if you take 2 minutes to send for a free copy of "Your Future in the New World of Electronics."

This helpful book shows you how CREI Home Study leads the way to greater earnings through the inviting opportunities described above.

However, being an accredited technical school, CREI does not promise you a "bed-of-roses." You have to translate your willingness to learn into saleable technical knowledge

—via *study*. Since its founding in 1927, CREI has provided thousands of professional radiomen with technical educations. During World War II, CREI trained thousands for the Armed Services. Leading firms choose CREI courses for group training in electronics at company expense, among them United Air Lines, Canadian Broadcasting Corporation, Trans Canada Airlines, Bendix Products Division, All-American Cables and Radio, Inc., RCA-Victor Division, and the Machlett Laboratories.

CREI courses are prepared by recognized experts, in a practical, easily-understood manner. You get the benefit of time-tested materials, under the personal supervision of a CREI Staff Instructor. This complete training is the reason why CREI graduates find their diplomas keys-to-success in Radio, TV and Electronics. CREI alumni hold top positions in America's leading firms.

At your service is the CREI Placement Bureau, which finds positions for students and graduates. Although CREI does not guarantee jobs, requests for personnel currently exceed supply by far.

Talk to men in the field and check up on CREI's high standing in electronics instruction. Determine for yourself right now that your earnings are going to rise with your knowledge—and that you get your rightful place in the Age of Electronics. All this CREI can promise you, provided you sincerely want to learn. Fill out the coupon and mail it today. We'll promptly send you your free copy of "Your Future in the New World of Electronics." The rest—the future—is up to you.

## MAIL COUPON FOR FREE BOOKLET

### CAPITOL RADIO ENGINEERING INSTITUTE

Dept. 141, 3224 16th St., N.W., Washington 10, D. C.

Send booklet "Your Future in the New World of Electronics" and course outline.

CHECK FIELD OF GREATEST INTEREST ☐ TV, FM & Advanced AM Servicing ☐ Aeronautical Radio Engineering ☐ Practical Television Engineering ☐ Broadcast Radio Engineering (AM, FM, TV) ☐ Practical Radio Engineering

Name.....

Street.....

City.....

Zone.....

State.....

If residence school in Wash., D. C. preferred, check here ☐



# RADIO - ELECTRONICS

Formerly RADIO-CRAFT • Incorporating SHORT WAVE CRAFT • TELEVISION NEWS • RADIO & TELEVISION\*

## CONTENTS

JANUARY 1953

### 6TH ANNUAL TV ISSUE

Hugo Gernsback  
Editor-in-Chief

M. Harvey Gernsback  
Editorial Director

Fred Shunaman  
Managing Editor

Robert F. Scott  
W2PWG, Technical Editor

Mortimer Bernstein  
Associate Editor

I. Queen  
Editorial Associate

Matthew Mandl  
Television Consultant

Angie Pascale  
Production Manager

Wm. Lyon McLaughlin  
Tech. Illustration Director

Sol Ehrlich  
Art Director

Lee Robinson  
General Manager

John J. Lamson  
Sales Manager

G. Aliquo  
Circulation Manager

Robert Fallath  
Promotion Manager

#### Editorial (Page 29)

New Television Trends .....by Hugo Gernsback 29

#### Television (Pages 30-84)

UHF Opens Up .....by Raymond F. Guy 30

TV Distribution Systems .....by Eric Leslie 34

European TV Network ..... 37

The New UHF Channels ..... 38

New TV Areas .....by John F. Rider 39

NTSC Color TV .....by Edward Sieminski 42

TV DX in 1952 .....by E. P. Tilton 45

Two More U.H.F. Converters .....by Fred King 48

Circuit Shorts .....by Robert F. Scott 51

TV—It's a Cinch, Part I .....by E. Aisberg 54

U.H.F. Circuitry ..... 57

Television Antenna Products Directory ..... 60

TV Comes to Portland .....by Victor Bory 62

Kinescope Replacement Chart .....by E. W. Scott 64

Television Components for Conversion or Repair ..... 66

TV Service Clinic .....Conducted by Matthew Mandl 69

TV Booster Characteristics ..... 70

Directory of TV Receiver Characteristics ..... 72

#### Audio (Pages 96-104)

Push-Pull Drivers .....by George Fletcher Cooper 96

Electronic Music—The Easiest Way, Part II .....by V. Fastenaekels 102

#### Servicing—Test Instruments (Pages 106-116)

Crystal Markers for Sweep Generator .....by Bruce Morrisette 106

Quick Capacitor Checker .....by George Kelly 114

#### Construction (Pages 118-135)

Polarized Power Plugs for the Experimenter .....by L. B. Hedgo 118

SW Converter .....by Richard Graham 122

Improving Oscillator and A. V. C. Operation .....by James Sareda 130

#### New Design (Pages 138-139)

New Long Life Cell Boon to Portables ..... 138

#### ANNUAL RADIO-ELECTRONICS INDEX ..... 168

#### Departments

The Radio Month ..... 12 Try This One ..... 152

Radio Business ..... 18 Question Box ..... 156

With the Technician ..... 136 Technotes ..... 159

New Patents ..... 140 People ..... 165

New Devices ..... 143 Miscellany ..... 168

Radio-Electronic Circuits ..... 146 Communications ..... 175

Book Reviews ..... 176



MEMBER Audit Bureau of Circulations

Vol. XXIV, No. 1

**EXECUTIVE, EDITORIAL and ADVERTISING OFFICES:** 25 West Broadway, New York 7, N. Y. Telephone REctor 2-8630. Gernsback Publications, Inc. Hugo Gernsback, President; M. Harvey Gernsback, Vice-President; G. Aliquo, Secretary.  
**SUBSCRIPTIONS:** Address correspondence to Radio-Electronics, Subscription Dept., Erie Avenue, F to G Sts., Philadelphia 32, Pa., or 25 West Broadway, New York 7, N. Y. When ordering a change please furnish an address stencil impression from a recent wrapper. Allow one month for change of address.  
**SUBSCRIPTION RATES:** In U. S. and Canada, in U. S. possessions, Mexico, South and Central American countries, \$3.50 for one year; \$6.00 for two years; \$8.00 for three years; single copies 30¢. All other foreign countries \$4.50 a year, \$8.00 for two years; \$11.00 for three years.  
**BRANCH ADVERTISING OFFICES:** Chicago: 100 E. Ohio St., Tel. Superior 7-1798. Los Angeles: Ralph W. Harker, 1127 Wilshire Blvd., Tel. Madison 6-1271. San Francisco: Ralph W. Harker, 582 Market St., Tel. Garfield 1-2481. **FOREIGN AGENTS:** Great Britain: Atlas Publishing and Distributing Co., Ltd., London E.C.4. Australia: McGill's Agency, Melbourne, France: Brentano's, Paris 2e. Holland: Trilectron, Heemstede. Greece: International Book & News Agency, Athens, So. Africa: Central News Agency, Ltd., Johannesburg. Capetown: Durban, Natal: Universal Book Agency, Johannesburg. Middle East: Stelmatsky Middle East Agency, Jerusalem. India: Broadway News Centre, Dadar, Bombay #14. K. L. Kannappa Mudaliar, Madras 2. Pakistan: Paradise Book Stall, Karachi 3. \*Trademark registered U.S. Patent Office.

RADIO-ELECTRONICS





**AS A NATIONAL SCHOOLS GRADUATE THERE'S A PLACE FOR YOU IN THIS EXPANDING INDUSTRY...Never before**

such a demand for you! For never before such a growing industry as today's Television, Radio and other Electronic fields. This industry needs you... TODAY... and it needs you as a trained man... the kind of man you will be as a National Schools graduate. So don't wait. Start your National Schools training NOW...and enjoy big money, job security, SUCCESS!

**LEARN from EXPERTS! BE A SUCCESSFUL MAN YOURSELF!**

You learn from men who are themselves successful Radio, Television and Electronics technicians. You learn the practical way... by doing... with equipment we send you. And you advance quickly, step by step. Get ALL the facts from FREE book and sample lesson. Mail coupon below NOW. Absolutely no obligation.



↑  
All yours at  
no extra cost!

**Don't put it off! Mail coupon NOW!**

**EARN MORE MONEY AS AN EXPERT**

Get Shop-Method  
Training at Home in

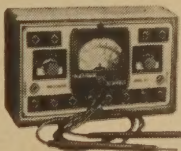
**RADIO  
TELEVISION  
ELECTRONICS**

One Master Course - One Low Tuition  
**LEARN ALL PHASES - EARN WHILE YOU LEARN**

**You can qualify FAST for these big-pay jobs...plus many more**

Radio Station Technician • Your own Sales and Service Shop • District Service Manager • Inspector Technician • Aircraft Radio Inspector • Special Govt. Positions • Service Specialist • Sound Truck Operator • and many others!

**ONLY NATIONAL SCHOOLS  
GIVES YOU THIS PROFESSIONAL**



**MULTI-TESTER**

Ready to use.  
Easy to  
operate. Light  
enough to  
carry on  
service calls.

**DRAFT AGE?** National Schools training helps you get into special service classifications—get higher grades, better pay!

**GET YOUR TRAINING FROM  
THE RADIO-TV CAPITAL OF  
THE WORLD**

Let Na-  
tional  
Schools



—a resi-  
dent technical trade school  
for nearly 50 years—train you  
at home for today's unlimited  
opportunities in Radio-TV.



**FREE!**

Radio-TV Book  
& Sample Lesson  
JUST MAIL  
COUPON!

**NATIONAL SCHOOLS GRADUATES IN BIG DEMAND.** You'll find National Schools graduates in good jobs everywhere. For these are the jobs National Schools trains you for. Such complete, shop-method home training can be your ticket to success...your key to the job happiness you've always wanted. It's up to you. Mail coupon NOW!

**FRIENDLY GUIDANCE AS STUDENT AND GRADUATE.** Our special Welfare Department is constantly at your service. Helps you with your technical and personal problems. Gives you the benefit of its wide industry contacts and experience in helping you after graduation. Write National Schools, 4000 South Figueroa St., Los Angeles 37, California.

**NATIONAL SCHOOLS**

APPROVED FOR  
G. I. TRAINING

Los Angeles, Calif. • Est. 1905 • In Canada: 193 Hastings St., Vancouver, B.C.

**YOU GET ALL THE PARTS INCLUDING TUBES** for this superheterodyne receiver... and lots of other equipment...to keep!

**NATIONAL SCHOOLS, Dept. RG-13  
4000 South Figueroa Street  
Los Angeles 37, California**

Send me FREE book "My Future in Radio-Television and Electronics." Also a FREE sample lesson. I understand no salesman will call on me and that there is no obligation.

NAME \_\_\_\_\_ AGE \_\_\_\_\_

ADDRESS \_\_\_\_\_

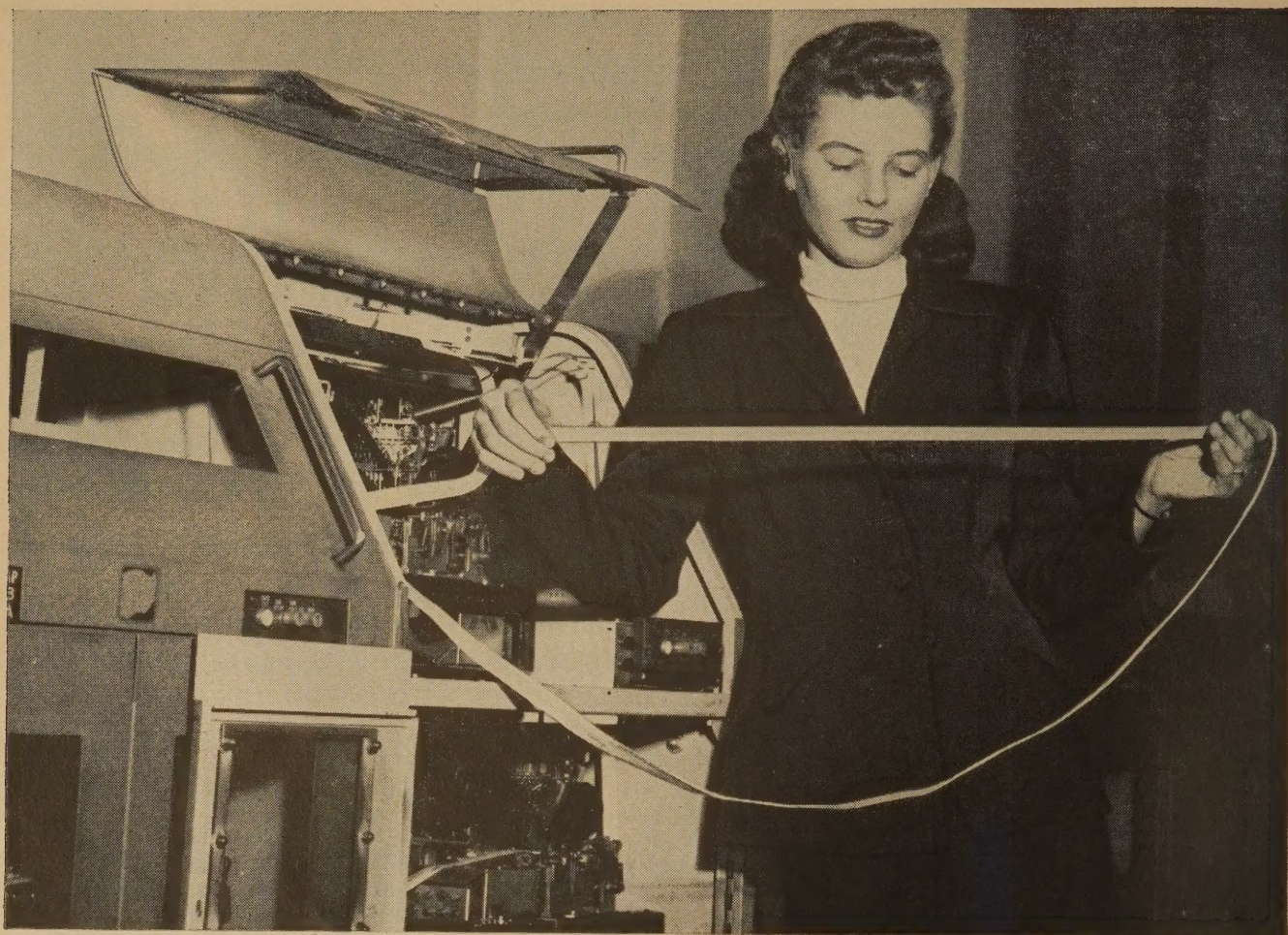
CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

☐ VETS! Check here if you are a veteran.

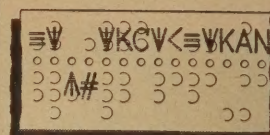
Mail in envelope  
or paste on  
postal card

**ACT  
NOW**

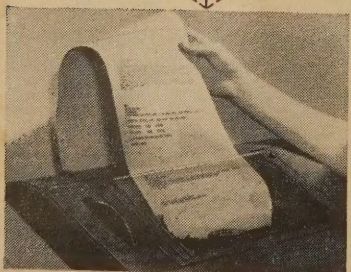




## *These signals find the way*



SENDING



RECEIVING

When you dial a telephone number, high-speed switching mechanisms select your party and connect you. Through a new development of Bell Telephone Laboratories, similar mechanisms are doing the same kind of job in private wire teletypewriter systems which America's great businesses lease from the telephone company.

Company X, for example, operates an air transportation business with scores of offices all over the country. At one of these offices, a teletypewriter operator wishes to send a message, let us say, to Kansas City. Ahead of the message, she types the code letters "KC". The letters become electric signals which guide the message to its destination.

Any or all stations in a network, or any combination of stations, can be selected. Switching centers may handle 50 or more messages a minute . . . some users send 30,000 messages a day. Delivery time is a few minutes.

Defense manufacturers, automobile makers, airlines and many other American businesses are benefiting by the speed and accuracy of the new equipment — another example of how techniques developed by the Laboratories for telephone use contribute to other Bell System services as well.



### BELL TELEPHONE LABORATORIES

Improving telephone service for America provides careers for creative men in scientific and technical fields.

RADIO-ELECTRONICS



# Now IN YOUR OWN HOME Learn TELEVISION RADIO

*the Amazingly Effective*

## D.T.I. WAY

—with the aid of **BOTH**  
**HOME EQUIPMENT**  
and **HOME MOVIES**

**NO PREVIOUS EXPERIENCE NEEDED**  
**NOW...get**  
**EVERYTHING**  
**YOU NEED**  
for real Laboratory-  
Type training  
**AT HOME**

Above:  
Work over  
**300**  
fascinating  
experiments  
with this  
equipment

**1. Build over 300 fasci-**  
nating experiments  
from **16 BIG SHIPMENTS**  
of Electronic-Radio parts  
which you **KEEP**.

**2. Build valuable commer-**  
cial-type test equipment—as  
shown to the left—which you  
**KEEP**. This includes a quality  
**OSCILLOSCOPE**—a must for  
Television work.

**3. Use a 16 mm. movie projector**  
and new series of Hollywood pro-  
duced instructive movies—a wonder-  
ful aid to help you grasp important  
fundamentals faster...easier...better.

**4. Enjoy well-illustrated, easy-to-read**  
lessons with handy **FOLD-OUT** diagrams.

**5. Get an honest-to-goodness EMPLOY-**  
MENT SERVICE to help you get a good job  
after graduating—or assistance in starting  
your **OWN SALES AND SERVICE BUSINESS**.  
Mail coupon today for the complete details.

What will mailing the coupon below *do* for **YOU**? Just this! You'll find out about one of today's most remarkable...practical ways to prepare to get into America's amazing billion dollar opportunity field of **TELEVISION-RADIO-ELECTRONICS**. You'll see how to get into fascinating work that pays well...that offers one of America's most promising futures...that enables you to start your own business almost "on a shoe string," if you prefer this to a job opportunity.

And above all, you'll get some **GOOD NEWS** especially welcomed by men anxious to earn **REAL MONEY** in this thrilling field. For you'll see that **NOW** you can get the kind of practical, laboratory-type training so desirable for making real progress in Television-Radio-Electronics...and **WITHOUT LEAVING HOME**.

You'll see that DeForest's Training, Inc. sends everything needed to set up your own **HOME LABORATORY**. You get and keep the same type of basic electronic equipment used in our modern Chicago Training Laboratories. You get home training that includes the knowledge and experience gained from training thousands of students first hand in Chicago. And to top it all, you use DTI's amazingly effective and exclusive home training aid—**INSTRUCTIVE MOVIES**. But why not get the complete story? Mail coupon today for information-packed literature.

### MODERN LABORATORIES

If you prefer, get all your preparation in our new Chicago Training Laboratories—one of the finest of its kind. Ample instructors, modern equipment. Write for details!

### MILITARY SERVICE!

If you're subject to military service, the information we have for you should prove very helpful. Mail coupon today.

Get **BOTH** of these colorful,  
information-packed folders  
**FREE**

**89 WAYS**  
**TO**  
**EARN**  
**MONEY**  
**IN TELEVISION**

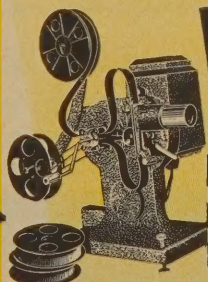
**YOU GET**  
**ALL 6**

*Mail Coupon  
Today*

**DeFOREST'S TRAINING, INC., DEPT. RE-1-J**  
2533 N. Ashland Avenue, Chicago 14, Ill.

I would like valuable,  
information-packed folders showing how I may get started  
toward a good job or my own business in Television-  
Radio-Electronics.

Name \_\_\_\_\_ Age \_\_\_\_\_  
Street \_\_\_\_\_ Apt. \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



New "black"  
RECTANGULAR  
TUBE

**DeFOREST'S TRAINING, INC.**

AFFILIATED WITH  
**De Vry Technical Institute**  
CHICAGO 14, ILLINOIS



**ends low line  
voltage hazard\***

**CREST LVB-117**

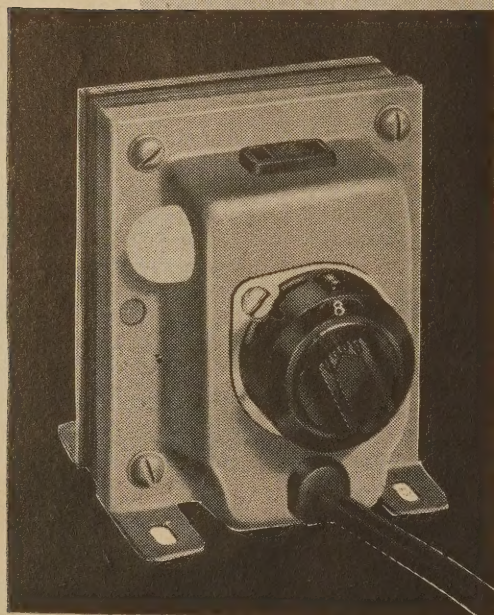
Line Voltage Booster

**ACCURATE  
VOLTAGE  
BOOST!**

End low line hazard\* . . . sub-normal line voltage may cause damage or improper operation of TV set or electrical appliance.

The LVB-117 is engineered to restore peak performance to any TV set or electrical equipment.

Insures full strength, width, and height of the TV picture when low line voltage weakens or shrinks picture. Corrects intermittent sync and oscillator drift caused by low line voltage.



**6 unique features for the ultimate  
in ACCURATE VOLTAGE BOOST**

- ✓ **300 WATT RATING** . . . ample for most requirements
- ✓ **SIMPLE EXTERNAL PLUG-IN** . . . 10 second installation aids over the counter sales
- ✓ **AUTOMATICALLY OPERATED** . . . turns on and off with set or appliance
- ✓ **MULTI-TAP SELECTOR SWITCH** . . . permits exact voltage boost
- ✓ **VISUAL INDICATOR** . . . assures exact selection of required boost
- ✓ **OVERLOAD CUT OUT** . . . protects against unsafe line voltage increase.

*Available at local jobbers or write for full details  
and name of nearest representative.*

**\$17<sup>95</sup>**

**LIST**

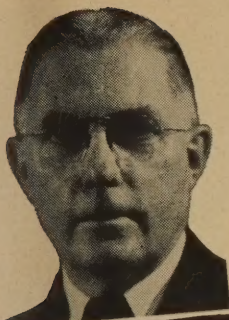
Standard RTMA Guarantee

**CREST**

**LABORATORIES, INC.**

**84-11 Rockaway Beach Blvd.  
Rockaway Beach 93, N. Y.  
Far Rockaway 7-2732**

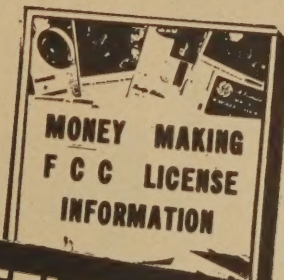




Edward H. Guilford  
Executive Vice President

# Want To DOUBLE YOUR PAY?

## How To Pass FCC COMMERCIAL RADIO OPERATOR LICENSE EXAMINATIONS



**TELEVISION  
ENGINEERING**  
included in our  
Training and coaching

**GET THIS AMAZING NEW BOOKLET FREE!**

TELLS HOW...

### WE GUARANTEE

TO TRAIN AND COACH YOU AT  
HOME IN SPARE TIME UNTIL YOU GET

### YOUR FCC LICENSE

If you have had any practical experience—Amateur, Army, Navy, radio repair, or experimenting.

HERE IS YOUR GUARANTEE

If you fail to pass your Commercial License exam after completing our course, we guarantee to continue your training without additional cost of any kind, until you successfully obtain your Commercial license, provided you first sit for this examination within 90 days after completing your course.

TELLS HOW...

### Our Amazingly Effective JOB-FINDING SERVICE

Helps CIRE Students Get Better Jobs

Here are a few recent examples of Job-Finding results:

#### GETS CIVIL SERVICE JOB

"Thanks to your course I obtained my 2nd phone license, and am now employed by Civil Service at Great Lakes Naval Training Station as an Equipment Specialist."  
Kenneth R. Leiser, Fair Oaks, Mtd. Del., McHenry, Ill.

#### GETS STATE POLICE JOB

"I have obtained my 1st class ticket (thanks to your school) and since receiving same I have held good jobs at all times. I am now Chief Radio Operator with the Kentucky State Police."

Edwin P. Healy, 264 E. 3rd St., London, Ky.

#### GETS BROADCAST JOB

"I wish to thank your Job-Finding Service for the help in securing for me the position of transmitter operator here at WCAE in Pittsburgh."

Walter Koschik, 1442 Ridge Ave., N. Braddock, Pa.

#### GETS AIRLINES JOB

"Due to your Job-Finding Service, I have been getting many offers from all over the country, and I have taken a job with Capital Airlines in Chicago, as a Radio Mechanic."

Harry Clare, 4537 S. Drexel Blvd., Chicago, Ill.

TELLS HOW...

### Employers Make JOB OFFERS Like These to Our Graduates Every Month!

Letter from Chief Engineer, Broadcast Station, North Carolina. "Need men with radiotelephone 1st class licenses, no experience necessary. Will learn more than at average station for we are equipped with Diesel Electric power, transmitting and studio equipment."

Telegram from Chief Engineer, Broadcast Station, Wyoming. "Please send latest list available first class operators. Have November 10th opening for two combo men."

Letter from Chief Engineer, Broadcast Station, Texas. "Please send list of latest licensed graduates."

These are just a few examples of the job offers that come to our office periodically. Some licensed radioman filled each of these jobs . . . it might have been you!

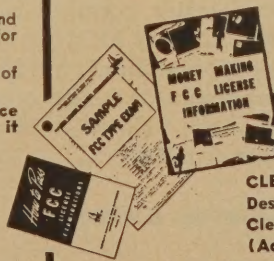
### HERE'S PROOF FCC LICENSES ARE OFTEN SECURED IN A FEW HOURS OF STUDY WITH OUR COACHING AT HOME IN SPARE TIME

Name and Address	License	Lessons
Lee Worthy 2210 1/2 Wilshire St., Bakersfield, Calif.	2nd Phone	16
Clifford E. Vogt Box 1016, Dania, Fla.	1st Phone	20
Francis X. Foerch 38 Beuler Pl., Bergenfield, N. J.	1st Phone	38
S/Sgt. Ben H. Davis 317 North Roosevelt, Lebanon, Ill.	1st Phone	28
Albert Schoell 110 West 11th St., Escondido, Calif.	2nd Phone	23

#### CLEVELAND INSTITUTE OF RADIO ELECTRONICS

Carl E. Smith, E. E., Consulting Engineer, President  
Desk RE-48, 4900 Euclid Bldg., Cleveland 3, Ohio

OURS IS THE  
ONLY HOME  
STUDY COURSE  
WHICH SUP-  
PLIES FCC-TYPE  
EXAMINATIONS  
WITH ALL LES-  
SONS AND FINAL  
TESTS.



Your FCC Ticket is recognized in all radio  
fields as proof of your technical ability.

### MAIL COUPON NOW

CLEVELAND INSTITUTE OF RADIO ELECTRONICS  
Desk RE-48—4900 Euclid Bldg.  
Cleveland 3, Ohio  
(Address to Desk No. to avoid delay.)

I want to know how I can get my FCC ticket in a minimum of time. Send me your FREE booklet: "How to Pass FCC License Examinations" (does not cover exams. for Amateur License), as well as a sample FCC-type exam and the amazing new booklet, "Money-Making FCC License Information."

☐ Tell me about your Television Engineering Course.

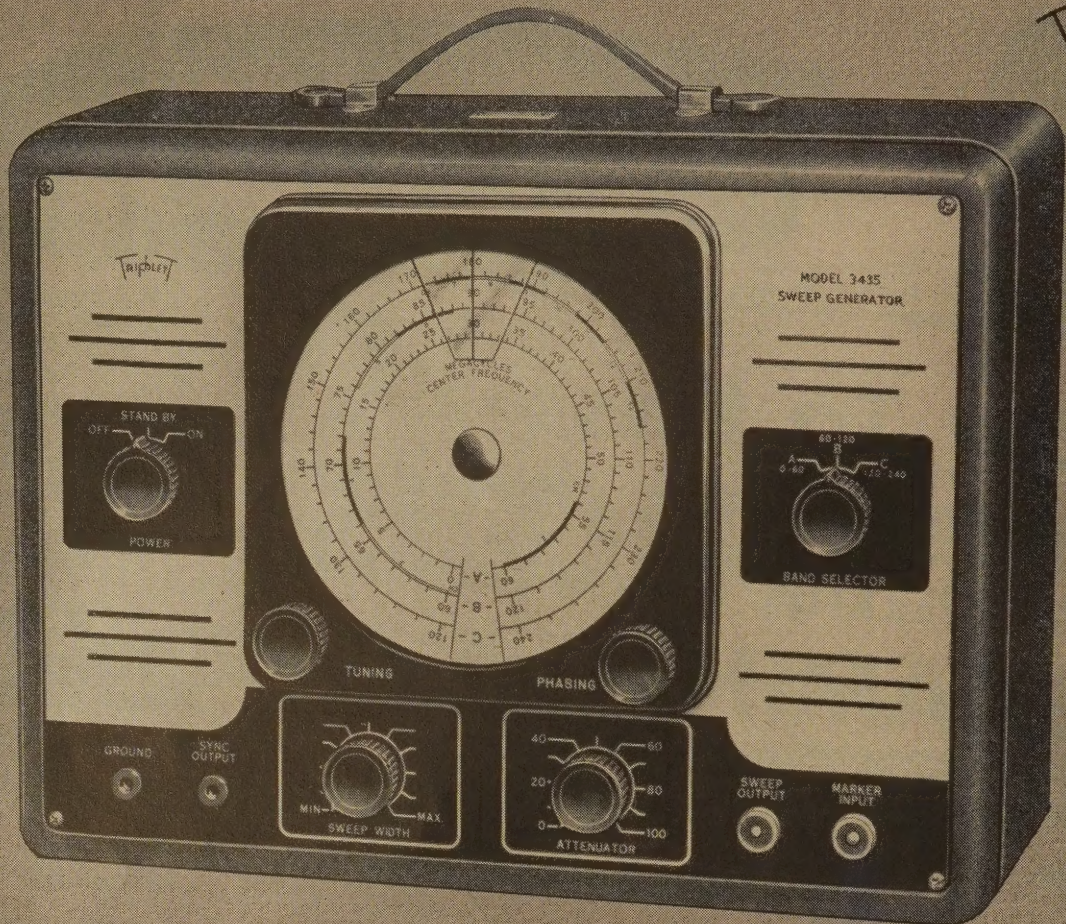
Name.....

Address.....

City..... Zone..... State.....

Paste on two cent postcard or send air mail.




  
3435


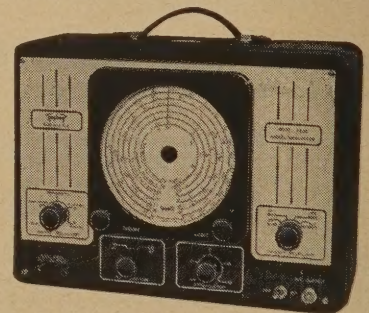
## Only \$114.50 and you're in Profitable TV Testing

Value-wise you can't make a smarter buy. For if you have a good Signal Generator to use as a marker with 3435, this new Triplet Sweep saves you real money! Performance-wise it's Triplet Engineering at its best. There are no complications in use. Continuous range coverage to 240 MC for all TV carrier and IF frequencies. There are no gaps in frequency, and continuous tuning is provided over all TV and FM bands. Note MAIN frequency dial, marked with channels as well as frequencies; continuously variable sweep width, effective from 500 KC to 12 MC; the PHASE controlled sweep voltage for scope horizontal input; the STAND-BY switch for temporary silencing of generator during other testing. These and many other features make Triplet 3435 an outstanding "buy." See it today at your distributor's.

TRIPLET ELECTRICAL INSTRUMENT COMPANY, BLUFFTON, OHIO

### YOU CAN USE ANY A.M. SIGNAL GENERATOR

...but if you are critical you'll appreciate this Wide Range Test Oscillator — Triplet 3432. Five fundamental ranges—165 KC to 40 MC. Two Harmonic ranges 36-120 MC, directly calibrated. Completely Shielded. Seven directly calibrated 330° scales. Illuminated Dial. Try it today.



Triplet 3432



# Triplet

FOR THE MAN WHO TAKES PRIDE IN HIS WORK



# LEARN RADIO



# INSIDE OUT!

**T**HAT's the way to become an expert radio serviceman. Study the theory and principles first. These are vitally important. Then roll up your sleeves and actually work with radios—assembling, experimenting, trouble-shooting, repairing. That way you learn radio *from the inside out.*

Which explains why I.C.S., in its new Radio Course, concentrates on *equipment*. You get the best. Matched parts for an excellent 5-tube superheterodyne receiver. Your own professional-quality multimeter. A complete signal generator

kit. High-grade servicemen's tools. "Rider's Perpetual Trouble-Shooter's Manual." Plus lesson material and instruction service second to none. Also included is Principles of Tele-

vision, which is a steppingstone to TV installation and service. And there's a new course in *FM and Television* that includes *COLOR TV!*

Learn by doing! That's the famous I.C.S. method. Practical. Modern. *Success proved.* The coupon below brings you full details—on radio servicing or any of the 391 I.C.S. Courses. Mail it *today!*

## INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 2880-8, SCRANTON 9, PENNA.

Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:

- |   |   |   |   |   |
|---|---|---|---|---|
| <b>ART</b><br><input type="checkbox"/> Commercial Art<br><input type="checkbox"/> Magazine and Book Illustrating<br><input type="checkbox"/> Cartooning<br><input type="checkbox"/> Show Card and Sign Lettering<br><input type="checkbox"/> Fashion Illustrating<br><b>AUTOMOTIVE</b><br><input type="checkbox"/> Automobile, Mechanic<br><input type="checkbox"/> Auto-Elec. Technician<br><input type="checkbox"/> Auto Body Rebuilding and Refinishing<br><input type="checkbox"/> Diesel—Gas Engines<br><b>AVIATION</b><br><input type="checkbox"/> Aeronautical Engineering Jr.<br><input type="checkbox"/> Aircraft Engine Mechanic<br><input type="checkbox"/> Airplane Drafting<br><b>BUILDING</b><br><input type="checkbox"/> Architecture<br><input type="checkbox"/> Arch. Drafting<br><input type="checkbox"/> Building Contractor<br><input type="checkbox"/> Estimating<br><input type="checkbox"/> Carpenter and Mill Work<br><input type="checkbox"/> Carpenter Foreman<br><input type="checkbox"/> Reading Blueprints<br><input type="checkbox"/> House Planning<br><input type="checkbox"/> Plumbing | <input type="checkbox"/> Heating<br><input type="checkbox"/> Steam Fitting<br><input type="checkbox"/> Air Conditioning<br><input type="checkbox"/> Electrician<br><b>BUSINESS</b><br><input type="checkbox"/> Business Administration<br><input type="checkbox"/> Certified Public Accountant<br><input type="checkbox"/> Accounting<br><input type="checkbox"/> Bookkeeping<br><input type="checkbox"/> Stenography and Typing<br><input type="checkbox"/> Secretarial<br><input type="checkbox"/> Federal Tax<br><input type="checkbox"/> Business Correspondence<br><input type="checkbox"/> Personnel and Labor Relations<br><input type="checkbox"/> Advertising<br><input type="checkbox"/> Retail Business Management<br><input type="checkbox"/> Managing Small Business<br><input type="checkbox"/> Sales Management<br><input type="checkbox"/> Salesmanship<br><input type="checkbox"/> Traffic Management<br><b>CHEMISTRY</b><br><input type="checkbox"/> Chemical Engineering<br><input type="checkbox"/> Chemistry<br><input type="checkbox"/> Analytical Chemistry<br><input type="checkbox"/> Petroleum—Nat'l Gas<br><input type="checkbox"/> Pulp and Paper Making<br><input type="checkbox"/> Plastics | <b>CIVIL, STRUCTURAL ENGINEERING</b><br><input type="checkbox"/> Civil Engineering<br><input type="checkbox"/> Structural Engineering<br><input type="checkbox"/> Surveying and Mapping<br><input type="checkbox"/> Structural Drafting<br><input type="checkbox"/> Highway Engineering<br><input type="checkbox"/> Reading Blueprints<br><input type="checkbox"/> Concrete Construction<br><input type="checkbox"/> Sanitary Engineering<br><b>DRAFTING</b><br><input type="checkbox"/> Aircraft Drafting<br><input type="checkbox"/> Architectural Drafting<br><input type="checkbox"/> Electrical Drafting<br><input type="checkbox"/> Mechanical Drafting<br><input type="checkbox"/> Structural Drafting<br><input type="checkbox"/> Sheet Metal Drafting<br><input type="checkbox"/> Mine Surveying and Drafting<br><b>ELECTRICAL</b><br><input type="checkbox"/> Electrical Engineering<br><input type="checkbox"/> Electrician<br><input type="checkbox"/> Electrical Maintenance<br><input type="checkbox"/> Electrical Drafting<br><input type="checkbox"/> Electric Power and Light<br><input type="checkbox"/> Lineman<br><b>HIGH SCHOOL</b><br><input type="checkbox"/> High School Subjects | <input type="checkbox"/> College Preparatory<br><input type="checkbox"/> Mathematics<br><input type="checkbox"/> Commercial<br><input type="checkbox"/> Good English<br><b>MECHANICAL AND SHOP</b><br><input type="checkbox"/> Mechanical Engineering<br><input type="checkbox"/> Industrial Engineering<br><input type="checkbox"/> Industrial Supervision<br><input type="checkbox"/> Foremanship<br><input type="checkbox"/> Mechanical Drafting<br><input type="checkbox"/> Machine Design-Drafting<br><input type="checkbox"/> Machine Shop Practice<br><input type="checkbox"/> Tool Design<br><input type="checkbox"/> Industrial Instrumentation<br><input type="checkbox"/> Machine Shop Inspection<br><input type="checkbox"/> Reading Blueprints<br><input type="checkbox"/> Toolmaking<br><input type="checkbox"/> Gas—Electric Welding<br><input type="checkbox"/> Heat Treatment—Metallurgy<br><input type="checkbox"/> Sheet Metal Work<br><input type="checkbox"/> Sheet Metal Pattern Drafting<br><input type="checkbox"/> Refrigeration<br><b>POWER</b><br><input type="checkbox"/> Combustion Engineering<br><input type="checkbox"/> Diesel—Electric<br><input type="checkbox"/> Electric Light and Power | <input type="checkbox"/> Stationary Steam Engineering<br><input type="checkbox"/> Stationary Fireman<br><b>RADIO, TELEVISION, COMMUNICATIONS</b><br><input type="checkbox"/> General Radio<br><input type="checkbox"/> Radio Operation<br><input type="checkbox"/> Radio Servicing—FM<br><input type="checkbox"/> Television<br><input type="checkbox"/> Electronics<br><input type="checkbox"/> Telephone Work<br><b>RAILROAD</b><br><input type="checkbox"/> Locomotive Engineer<br><input type="checkbox"/> Diesel Locomotive<br><input type="checkbox"/> Air Brakes <input type="checkbox"/> Car Inspector<br><input type="checkbox"/> Railroad Administration<br><b>TEXTILE</b><br><input type="checkbox"/> Textile Engineering<br><input type="checkbox"/> Cotton Manufacture<br><input type="checkbox"/> Rayon Manufacture<br><input type="checkbox"/> Woolen Manufacture<br><input type="checkbox"/> Loom Fixing<br><input type="checkbox"/> Finishing and Dyeing<br><input type="checkbox"/> Textile Designing<br><b>HOME ARTS</b><br><input type="checkbox"/> Dressmaking and Designing<br><input type="checkbox"/> Cookery<br><input type="checkbox"/> Tea Room Management |
|---|---|---|---|---|

Name \_\_\_\_\_ Age \_\_\_\_\_ Home Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Working Hours \_\_\_\_\_ A.M. to \_\_\_\_\_ P.M.

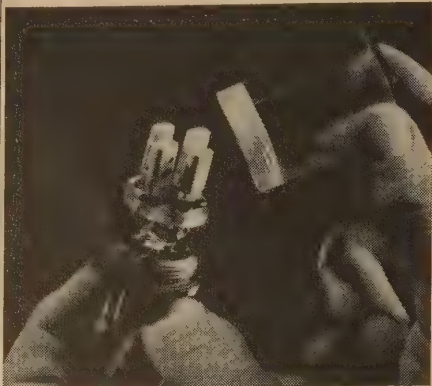
Occupation \_\_\_\_\_

Special tuition rates to members of the Armed Forces. Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada



**RCA SHOWS TRANSISTOR** progress in a wide range of radio, television, and industry applications. The demonstration was held November 17, at the David Sarnoff Research Center in Princeton, N. J.

Transistors were shown operating a portable television receiver, radio sets,



The transistor push-pull output stage.

loudspeaker systems, miniature transmitters, parts of electronic computers, and other experimental devices.

The portable TV set was a single-channel battery-operated receiver with a five-inch screen, no larger than a portable typewriter (12 x 13 x 7 inches). With only a built-in loop antenna the 27-pound receiver produced satisfactory pictures on channel 4 five miles from the Empire State Building. A small "rabbit-ear" antenna boosted its range to fifteen miles.

The experimental receiver has 37 transistors. Its total power consumption is only 14 watts, less than 1/10th that of a standard table-model set.

An experimental push-button-tuning automobile radio with 11 transistors provided comparable audio output to standard present-day types.

An important feature of this all-transistor set is the elimination of the B supply (vibrator, transformer, and rectifier). The transistors operate directly off the six-volt automobile battery. Total battery drain with the experimental receiver is only one amp (including two pilot lights).

An entirely new kind of audio power

amplifier was also shown. This consists of nothing but the four experimental junction transistors shown in the photograph.

These are pairs of *p-n-p* and *n-p-n* transistors in a bridge arrangement, acting as a push-pull amplifier and driving a speaker voice coil directly. Such a device can do the job that now requires two or more tubes, a phase inverter, an output transformer, and other components.

**MICROWAVES MAKE MEALS** to order in seconds in new *Lunch-O-Mat* slot-machine restaurant. Radar cooking, developed some years ago by Raytheon Manufacturing Company, is being used successfully for large-scale food preparation on the new *S.S. United States* and in many hotels and institutions. Refrigerated meats, soups, and beverages are cooked thoroughly in less than 15 seconds, without destroying vital nutritional elements. This appears to be the first successful attempt to use it in a vending machine.

Heart of the *Lunch-O-Mat's* hot-food section is the hand-size magnetron oscillator shown in the photograph.

**COMMUNITY ANTENNAS** have reached the stage of big business. A plan under consideration for Vancouver, Canada, would call for an expenditure of \$10 million. It is being considered as a serious business proposition by Famous Players Canadian Corp., and would bring programs from Seattle and Bellingham, Washington, to residents of Vancouver. Coaxial cable distribution and a coin-meter service is included in the plan. The antenna would be 300 feet high, mounted on high ground near the city.

In Corsicana, Texas, the city commission is considering an ordinance which would grant a 10-year franchise to a local company for a city-wide TV master antenna system. Tentative charges as proposed would be \$125 for connection to the system and from \$3.50 to \$4.50 a month as rental fee. A central tower high enough to assure the subscribers excellent television reception would be erected.



Latest arrival in the vending machine field is this coin-in-the-slot Radarange.

RADIO-ELECTRONICS

Complete  
control in  
details and  
manufacturing  
procedures

makes  
Tung-Sol Tubes  
dependable!

You can build  
a reputation  
on Tung-Sol  
Quality

**TUNG-SOL®**  
RADIO, TV TUBES, DIAL LAMPS

TUNG-SOL ELECTRIC INC., Newark 4, N. J.  
Sales Offices: Atlanta • Chicago • Culver City  
Dallas • Denver • Detroit • Newark

Tung-Sol makes All-Glass Sealed Beam Lamps,  
Miniature Lamps, Signal Flashers, Picture Tubes,  
Radio, TV and Special Purpose Electron Tubes.



THE ONLY COMPLETE CATALOG FOR  
EVERYTHING IN TV, RADIO AND  
INDUSTRIAL ELECTRONICS

get your 1953 **FREE**

**ALLIED**

**236-PAGE CATALOG**

it's complete  
it's value-packed

THE WORLD'S LARGEST STOCKS

- TV and Radio Parts
- Test Instruments
- Hi-Fi and P.A. Equipment
- Custom TV Chassis
- AM, FM Tuners & Radios
- Recorders and Supplies
- Amateur Station Gear
- Builders Supplies
- Equipment for Industry

**QUICK  
EXPERT  
SERVICE**

**SEND TODAY FOR RADIO'S  
LEADING BUYING GUIDE**

#### EASY-PAY TERMS

Take advantage of ALLIED's liberal Easy Payment Plan—Radio's best terms—only 10% down, 12 months to pay—no interest if you pay in 60 days. Available on Hi-Fi and P. A. units, recorders, TV chassis, test instruments, Amateur gear, etc.

#### TV & HI-FI SPECIALISTS

To keep up with developments in TV and High-Fidelity, look to ALLIED! Count on us for all the latest releases and largest stocks of equipment in these important fields. If it's *anything* in Television or High-Fidelity equipment—we have it in stock!

**free**



**Send for it today!**

Here's the *one* authoritative, complete Buying Guide to *Everything in Electronics*—packed with the world's largest selections of quality equipment at lowest money-saving prices. See the latest in TV custom chassis, TV antennas and accessories; AM and FM tuners and radios; High-Fidelity Custom Sound components; latest P.A. Systems and accessories; recorders; Amateur receivers, transmitters and station gear; specialized industrial electronic equipment; test instruments; builders' kits; huge listings of parts, tubes, tools, books—your choice of the world's *most complete stocks* of quality equipment.

ALLIED gives you every buying advantage; speedy delivery, expert personal help, lowest prices, liberal time payment terms, assured satisfaction. Get the latest 1953 ALLIED Catalog. Keep it handy—and save time and money. Send for your **FREE** copy today!

**EVERYTHING IN  
ELECTRONICS**

**ALLIED RADIO**

*World's Largest Electronic Supply House*

**ALLIED RADIO CORP., Dept. 2-A-3  
833 W. Jackson Blvd., Chicago 7, Illinois**

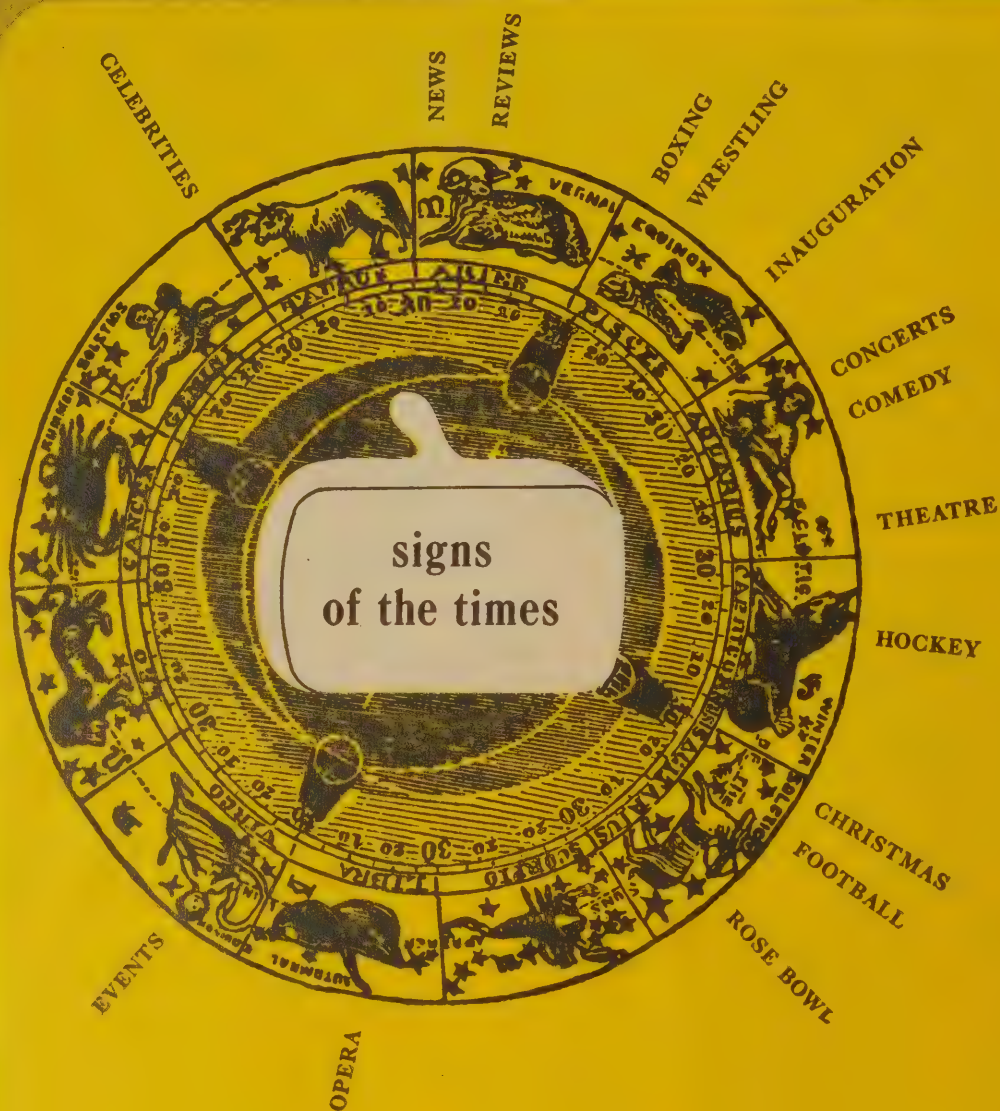
☐ Send **FREE** 236-Page 1953 ALLIED Catalog.

Name.....

Address.....

City..... Zone..... State.....





burton browne advertising

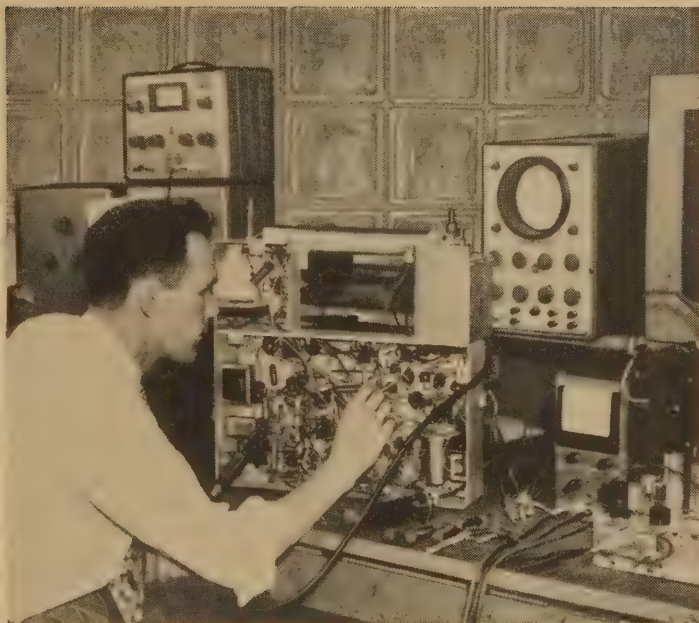
The stars show quality ascendant in the TV set owner's mind. *Follow your stars*—give the set owner the best picture tube replacement—Rauland. Your Rauland jobber anticipates your need today with a complete stock. The Rauland Corporation, 4245 N. Knox Avenue, Chicago 41, Illinois. MUlberry 5-5000.

# RAULAND

PERFECTION THROUGH RESEARCH



# Here's your Opportunity



## to prepare for a good job or a business of your own in TV SERVICING

**There are today more good jobs** open in TV Servicing than there are trained and experienced men to fill them. Yes, thousands of opportunities exist now for good-pay jobs offering employment security for years and years to come. Thousands of TV Servicing jobs are going begging. Do you want one of them?

Experts agree, that because of the critical shortage of trained and experienced TV Servicemen, and the tremendous future growth of the industry, no vocational field today offers more opportunities than TV Servicing.

### The Big New Industry with a Great Future

Television is just in the beginning stages of its big industrial boom. Look at these amazing facts:

- Lifting the freeze on new TV stations will open many new TV areas and will improve the coverage of existing areas. The result will be an enormous demand for TV receivers.

- Within a few years over 1000 TV stations will be telecasting compared with 108 TV stations now on the air.

- Nearly one-half of all families living within the present TV areas do not yet own TV receivers.

- The new trans-continental video network plus better and more interesting programs plus larger viewing screens and color TV will increase the installation of new receivers, will induce present owners of 12-inch and smaller size viewing screens to buy newer model receivers.

- The power increases of many existing stations and improved reception range of current receivers will result in receivers being installed and serviced in the fringe areas of present stations.

- Under the FCC proposal, over 70 per cent of all communities will be served by UHF channels exclusively. This means TV servicemen must know UHF receivers before the new UHF stations in their area are opened.

- No one yet knows how great the industrial TV market will be.

### RCA Institutes Home Study Course prepares you for a Career in TV Servicing

The addition of the RCA Institutes TV Service Training to your present radio-electronics experience will qualify you to step out and grasp the golden opportunities that now exist in television—America's fastest growing industry.

Learn at home—in your spare time—while you study the practical *how-to-do-it* techniques with *how-it-works* information. Easy-to-read and easy-to-understand lessons under the supervision of RCA engineers and experienced instructors quickly train you to qualify for the many good jobs now waiting for trained TV servicemen. Don't pass up this lifetime opportunity for financial security and a bright future in TV. Learn TV Servicing from RCA—pioneers and leaders in radio, television and electronic developments.

RCA Institutes conducts a resident school in New York City offering day and evening courses in Radio and TV Servicing, Radio Code and Radio Operating, Radio Broadcasting, Advanced Technology. Write for free catalog on resident courses.



**RCA INSTITUTES, INC.**  
A SERVICE OF RADIO CORPORATION of AMERICA  
350 WEST FOURTH STREET, NEW YORK 14, N.Y.

## Send for FREE BOOKLET

Mail the coupon—today. Get complete information on the RCA INSTITUTES Home Study Course in Television Servicing. Booklet gives you a general outline of the course by units. See how this practical home study course trains you quickly, easily. Mail coupon in envelope or paste on postal card.

### MAIL COUPON NOW!

RCA INSTITUTES, INC., Home Study Department RE-153  
350 West Fourth Street, New York 14, N. Y.

Without obligation on my part, please send me copy of booklet "RCA INSTITUTES Home Study Course in TELEVISION SERVICING." (No salesman will call.)

Name \_\_\_\_\_ (please print)

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_





## MOTOROLA-DETROIT CO.

one of the country's largest distributors of television sets and appliances

SAYS

# KRYLON

100% ACRYLIC

### IS A PROFITABLE ITEM TO STOCK FOR 2 REASONS

#### 1. TV SERVICEMEN BUY IT



"Our customers use Krylon and plenty of it," reports Motorola-Detroit parts manager, Paul Wallace. "The spray nozzle makes it easy to insulate the complete chassis in a matter of minutes." Because of its high dielectric strength, Krylon helps prevent corona.

#### 2. WE USE IT OURSELVES



Indoor service chief, John Workman, reports, "We use Krylon clear plastic coating to spray the bell part of metal picture tubes. Krylon stops dust from adhering to the tube and prevents arcing. We find Krylon is a must in television service operations."

#### ALSO

"Our appliance division uses White Krylon to touch up any white goods that become chipped. We're sold on White Krylon for one big reason—it won't turn yellow."

*Charles T. Wipff*  
Service Manager  
Motorola-Detroit Co.

In U.S.A. and CANADA  
SEE YOUR JOBBER  
Or Write For Information  
Department 3101

KRYLON, Inc.  
2601 N. Broad St., Philadelphia 32



**QRM ON CHANNELS 4 AND 5** is being caused by fixed-relay stations in the 72-76-mc band, according to a complaint filed with the FCC by the NARTB and station WCCO-TV, Minneapolis. In asking the Commission to reconsider assignments in the 4-mc non-TV gap between the channels, John M. Sherman, technical director of WCCO-TV, cited severe interference over large areas in Wisconsin and Minnesota from police relay stations operating on 73.22 and 74.5 mc.

**A SERIES OF SCIENCE FILMS** will be shown this fall on national TV network programs sponsored by the American Telephone & Telegraph Company. The 13 one-hour features will be made for AT&T by Hollywood producer Frank Capra. First two films to be presented are titled "The Sun" and "The Moon", with cost of production estimated at \$200,000 each.

**U.H.F.-TV SIGNALS** give practically the same degree of coverage as v.h.f. signals with the same transmitter power, reports the RCA Victor Division of RCA. Surveys made on KPTV, Portland, Oregon—the nation's first commercial u.h.f. station—show Class A coverage over a 20-mile radius, assuring good reception to 95% of the city's residents. Outlying districts within 30 to 40 miles of the transmitter get Class B coverage over favorable terrain. These signals reach 88% of the surrounding population, only 6% less than the estimated coverage for v.h.f. transmission. (See also page 62.)

**END OF RADIO LICENSE FEES** and opening of television field to private broadcasters were demanded by Canada's Liberal Party Council. The 253-member Council, in session at Ottawa, voted the demands over the objections of Revenue Minister McCann, who defended the Government's policy of vesting exclusive television rights in the Canadian Broadcasting Corporation.

**WEST GERMANY'S TV NETWORK** now stretches from Hamburg to Cologne, carries two hours of regular programs daily. The NWDR (Northwest German Radio) plans to extend the chain of u.h.f. relay links to southern Germany, and share programs with Dutch and Belgian TV networks, which also use the continental 625-line standard.

**THE "TELEPROMPTER,"** a device which unrolls a prepared script that can be seen only by the speaker, will be available to public speakers, nationally on a rental basis from the RCA Service Company, Inc. First brought to the public's attention at the national political conventions last July, the device feeds the manuscript, in letters an inch high, at a speed suited to the speaker's rate of delivery, and has been used for several years in TV studios. Synchronized multiple installations allow the speaker to move freely around the set or platform without losing sight of the written material.

**PRIVATE RADIO-MESSAGE** service, already established in New York, Cincinnati, and other U. S. cities, was inaugurated in Cleveland December 15. Subscribers hear personal code signals on vest-pocket receivers pre-tuned to 43.58 mc, then call service office for message. The system is similar to the *Air-Call*, operated in New York City by Telanserphone, and described in this magazine in October, 1951.

**BLASTS AT TV PROGRAMS** are no novelty, but Frank P. Walsh of West Hempstead, N. Y., hit the headlines (and the family TV receiver) on October 20, when he made his with a 38-caliber revolver. Walsh, who works nights as a plant security guard, tried vainly to sleep while his wife, mother-in-law, and five children watched a coast-to-coast comedy broadcast. Finally, because "it was playing too loud," he put an end to the program with one well-aimed shot through the picture tube. His wife called police, but Walsh was not held.

**BETTER DRY BATTERIES** are now being made by micropulverizing the chemical ingredients with ultrasonic vibrations. The method was invented by George Hunnath of Asbury Park, N. J., and is covered by U. S. Patent No. 2,613,877. Reducing the particles to the smallest possible size by supersonic agitation increases their chemical activity by exposing more surface to chemical activity.

**CANADIAN WIRED-RADIO-TV** service is being sued for copyright infringement. In a test case, Canadian Admiral Corporation has asked the Exchequer Court to hold Rediffusion, Inc. liable for damages in retransmitting Admiral-sponsored football telecasts without authorization. Rediffusion, Inc. rents radio and TV receivers, and supplies programs over leased wires to subscribers in Montreal.

**AUDIO ENGINEERING SOCIETY** elected the following new officers at its recent convention in New York City: president, F. Sumner Hall, F. Sumner Hall, Inc.; executive vice-president, Jerry B. Minter, Measurements Corp.; central vice-president, Walter S. Pritchard, Ohio Bell Telephone Co.; western vice-president, Richard L. Burgess, Allied Recording Mfg. Co.; secretary, C. J. LeBel, Audio Instruments Co., Inc.; treasurer, Ralph A. Schlegel, WOR Recording Studios; governors, Price E. Fish, Columbia Broadcasting System; Jay H. Quinn, Fairchild Recording Products Corp.; Carleton H. Sawyer, Bell Telephone Laboratories.

**BLACKMAILING TV-CHANNEL** applicants is a new racket reported from Washington. The blackmailer threatens to file a competitive application for an unopposed channel assignment unless paid off in cash or with an interest in the station. This new variation on the old shake-down theme is blamed on the shortage of FCC examiners to handle contested applications without delay.

END



JFD UHF Corner Reflector No. UHF400

UHF

JFD UHF Ultra V-Beam No. UHF500

JFD UHF YAGIS No. UHF300 Series for Channels 14 to 83

JFD UHF "Double-Vee" No. UHF100

JFD UHF "Bowtie-Flector" No. UHF600

JFD UHF Rhombic No. UHF 200

*JFD wins again!*

Be ready for UHF in any location with  
the first complete antenna line of its kind. Start  
today to build more profits and customer  
confidence with new JFD UHF antennas.  
Write for bulletins 172-6 for full details.



**JFD MFG. CO.**

BROOKLYN 4, N. Y.  
BENSONHURST 6-9200

world's largest manufacturer of  
tv antennas and accessories



**NEW!****2 GREAT BOOKS**

By Milton S. Kiver

**IF YOU SERVICE TV  
—YOU NEED THEM!****"TV Servicing Short-Cuts  
Based on Actual Case Histories"**

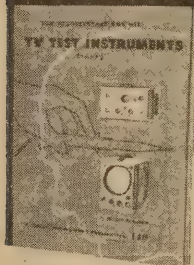
shows you how to  
solve commonly  
recurring troubles

the book that really  
teaches fast, expert  
service techniques

This book describes a  
series of actual TV service  
case histories, each pre-  
senting a specific problem  
about a specific receiver.

The symptoms of the  
trouble are described and then followed by a  
step-by-step explanation of how the service  
technician localized and tracked down the  
defect. Finally, there is a detailed discussion  
of how this particular trouble can be tracked  
down and solved in *any* TV set. The discus-  
sions which follow each case history are in-  
valuable—they explain how to apply the  
proper time-saving servicing techniques to  
any TV receiver. Here, in one volume, is the  
successful experience of experts—to make  
your service work easier, quicker, more pro-  
fitable. Over 100 pages, 5½ x 8½", illustrated.  
Pays for itself on a single service job.

ORDER TK-1. Only.....\$1.50

**"HOW TO UNDERSTAND AND USE  
TV TEST INSTRUMENTS"**

shows you how to get  
the most from your  
test instruments

Provides basic ex-  
planations of how  
each test instrument  
operates; describes  
functions of each con-  
trol and shows their  
proper adjustment to  
place the instrument

in operation. Covers: Vacuum Tube Volt-  
meters, AM Signal Generators, Sweep Signal  
Generators, Oscilloscopes, Video Signal  
Generators, Field Intensity Meters, Voltage  
Calibrators. Describes each in detail; explains  
functions; tells proper use in actual servicing;  
shows how to avoid improper indications.  
Because this book gives you a clear, complete  
understanding of your test instruments, you  
get more out of them, save time, and add to  
your earning power. Over 175 pages, 8½ x 11",  
illustrated.

ORDER TN-1. Only.....\$3.00

**HOWARD W. SAMS & CO., INC.**

Order from your Parts Jobber today, or  
write direct to Howard W. Sams & Co., Inc.,  
2205 East 46th Street, Indianapolis 5, Ind.

My (check) (money order) for \$.....  
enclosed. Send the following books:

☐ TK-1 (\$1.50) ☐ TN-1 (\$3.00)

Name.....

Address.....

City.....Zone.....State.....

**BAROMETER of the PARTS INDUSTRY**

During November, 50 of the leading 400 manufacturers of Radio-  
Television-Electronic parts and equipment made changes in their lines.  
Actually there was a decrease in "change activity" as compared to October.

In price revisions by the number of manufacturers and products affected,  
the following summary illustrates the comparative trend for the months of  
October and November.

	No. of Manufacturers	
	October	November
Increased prices	13	16
Decreased prices	11	7

	No. of Products	
	October	November
Increased prices	68	204
Decreased prices	49	136

For a summary of the most active product categories, see the following table:

Product Group	Increased Prices		Decreased Prices		New Products		Discontinued Products	
	No. of Mfrs.	No. of Products	No. of Mfrs.	No. of Products	No. of Mfrs.	No. of Products	No. of Mfrs.	No. of Products
Antennas & Acces.	2	12**	3	128*	7	124**	6	102*
Capacitors	0	0	0	0	2	48**	0	0
Controls & Resistors	0	0	0	0	1	1**	1	4*
Sound & Audio Prod.	2	10*	2	2*	6	61**	7	113*
Test Equipment	4	6*	0	0	2	5*	1	2**
Transformers	1	36*	0	0	5	57*	1	13*
Tubes	5	49*	1	5**	11	44**	4	14*
Wire & Cable	2	91*	1	1*	2	11**	0	0

\* Increase over October

\*\* Decrease from October

\* Increase over October

\*\* Decrease from October

**Comment:** There is an apparent trend toward increased prices by the leading TV Tube Manufacturers. While "change activity" continues to center around the introduction of new items, it is noticeable at this time that there is a decrease in the number of manufacturers involved.

This data is prepared by the staff of United Catalog Publishers, Inc., 110 Lafayette Street, New York, publishers of RADIO'S MASTER, the Official Buying Guide of the Parts Industry.

**Merchandising and Promotion**

P. R. Mallory & Co., Inc., Indianapolis, is backing up its u.h.f. converter sales with an aggressive promotion campaign. The merchandising plan includes a consumer product display, colorful banners, and envelope stuffers. Newspaper mats are also available in addition to suggested news releases for local news-



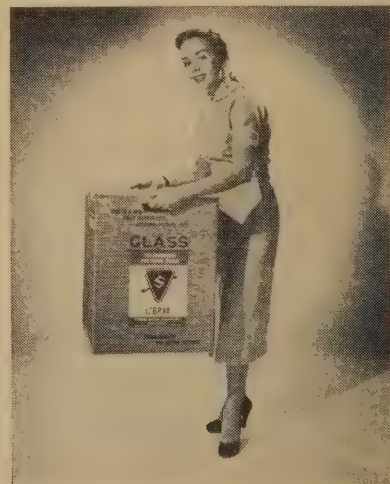
papers. The entire campaign has been tied together by advertising in consumer and trade publications.

Alliance Manufacturing Co., Alliance, Ohio, has prepared a series of one-minute TV spot film commercials in co-operation with its advertising agency, Foster & Davies, Inc., Cleveland. The commercials demonstrate the new Alliance *Cascamatic* booster which mounts out of sight on the back of the TV set, is pretuned to all v.h.f. stations and requires no manual controls.

Jensen Industries, Inc., Chicago, has prepared a new replacement phonograph

needle wall chart designed to simplify the work of the service technician and record dealer. The unique guide also aids in inventory control and shows authorized needle substitutions. The chart is available either directly from Jensen Industries or from its distributors.

The Sylvania Television Picture Tube Division, Seneca Falls, N. Y., is shipping its TV tubes for renewal sales in



a new factory-sealed carton which provides easy and safe handling. The new carton also adds an attractive note when displayed in service technicians' shops.

Allen B. Du Mont Laboratories, cathode-ray tube division, Clifton, N. J.,



J. E. SMITH  
President  
National Radio  
Institute  
Washington, D. C.

# I Will Train You at Home

## For Good Pay Jobs, Success in

# RADIO-TELEVISION



### YOU LEARN SERVICING

*by practicing with equipment I furnish*

You build valuable Multitester (at left) as part of my Servicing Course. You use it to make many tests, get practical experience, make EXTRA money fixing neighbors' radios in spare time. Many of my students earn \$5, \$10 a week extra while learning. I send you many other kits too. You build a modern Radio. You build many circuits common to Radio and Television. All equipment is yours to keep. Read about and see other equipment in my free book. Mail card below.



### YOU LEARN COMMUNICATIONS

*by practicing with equipment I furnish*

As part of my Communications Course I send you kits of parts to build the low power broadcasting transmitter shown at right and many other circuits common to Radio and Television. You use this equipment to get practical experience putting a station "on the air," performing procedures demanded of Broadcast Station operators. I train you for FCC Commercial Operator's License. Mail Card for Sample Lesson and 64-Page Book. FREE!



### TELEVISION is Today's Good Job Maker

In 1951 over 15,000,000 homes had Television sets, more are being sold every day. 108 TV stations are already operating, over 1800 are now authorized and many hundreds are expected to be on the air in 1953. This means new jobs, more jobs and better pay for trained men. The time to act is NOW! Start learning Radio-Television servicing or communications. Want to get ahead? America's fast growing industry offers good pay, a bright future and security. Cut out and mail card now. J. E. Smith, President, National Radio Institute, Washington, D. C.

**There are Good Jobs, Good Pay, Success  
in Radio-TV! SEE OTHER SIDE**

**CUT OUT AND MAIL THIS CARD NOW**

**Sample Lesson & 64-Page Book**

**Both FREE**

This card entitles you to Actual Lesson on Servicing, shows how you learn Radio-Television at home. You'll also receive my 64-Page Book, "How to Be a Success in Radio-Television." Mail card now!

**NO STAMP NEEDED! WE PAY POSTAGE**

**Mr. J. E. SMITH, President,  
National Radio Institute, Washington 9, D. C.**

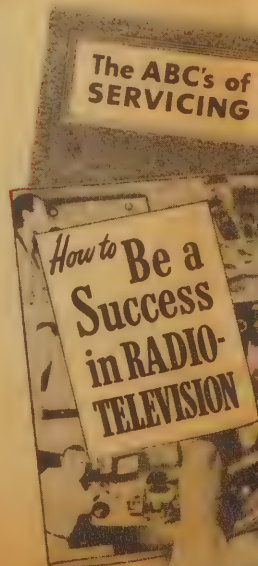
Mail me Lesson and Book, "How to Be a Success in Radio-Television." (No Salesman will call. Please write plainly.)

NAME.....AGE.....

ADDRESS.....

CITY.....ZONE.....STATE.....

A B C D





# Train at Home to Jump Your Pay as a RADIO-TV Technician



**J. E. Smith, President  
National Radio Institute**

The men whose letters are published below were not born successful. At one time they were doing exactly as you are doing now... reading my ad! But they acted. They decided they would know more... so they could earn more! They acted! Mail the card now for my 2 books FREE.

## There's a Bright Future for You in America's Fast Growing Industry

Do you want good pay, a job with a bright future, security? Would you like to have a profitable business of your own? If so, find out how you can realize your ambition in the fast growing RADIO-TELEVISION industry. Even without Television, the industry is bigger than ever before. 105 million home and auto radios, 2900 Radio Broadcasting Stations, 108 TV Stations with 1800 more now authorized. Expanding use of Aviation and Police Radio, Micro-Wave Relay, Two-Way

Radio for buses, taxis, etc., are making opportunities for Servicing and Communications Technicians and FCC Licensed Operators.

### You Learn by Practicing with Kits I Furnish

With both my Servicing Course and my NEW Communications Course I send you many Valuable Kits of Parts. They "bring to life" theory you learn in my illustrated texts. Mail card for my big 64-page book. It shows photos of equipment you build from kits I send.

### My Training Includes Television

Both my Servicing and Communications Courses include lessons on TV principles. You get practical experience by working on circuits common to both Radio and Television. My graduates are filling jobs, making good money in both Radio and Television. Remember, the way to a successful career in Television is through experience in Radio.

### Send NOW for 2 Books FREE

### Mail the Postage-Free Card NOW!

What will YOU be doing one year from today... will you be on your way toward a good job of your own in a Radio and Television service shop or business? Decide now that you are going to know more and earn more! ACT NOW! Take the important first step to a career and security. Send the postage-free card now for my FREE DOUBLE OFFER. You get Actual Servicing Lesson. Also my 64-page book, "How to Be a Success in Radio-Television." Read what my graduates are doing, earning; see equipment you practice with at home. Mail card now. J. E. SMITH, President, National Radio Institute, Washington 9, D.C. Our 39th year.

### NRI Training Can Lead to Jobs Like These in RADIO-TELEVISION

**BROADCASTING**  
Chief Technician  
Chief Operator  
Power Monitor  
Recording Operator  
Remote Control  
Operator

**SERVICING**  
Home and Auto  
Radios  
P.A. Systems  
Television Receivers  
Electronic Controls  
FM Radios

**IN RADIO PLANTS**  
Design Assistant  
Transmitter Design  
Technician  
Service Manager  
Tester  
Serviceman  
Research Assistant

**SHIP AND HARBOR  
RADIO**  
Chief Operator  
Assistant Operator  
Radiotelephone  
Operator

**GOVERNMENT RADIO**  
Operator in Army,  
Navy, Marine Corps,  
Coast Guard  
Forestry Service  
Dispatcher  
Airways Radio  
Operator

**AVIATION RADIO**  
Plane Radio Operator  
Transmitter Technician  
Receiver Technician  
Airport Transmitter  
Operator

**TELEVISION**  
Pick-up Operator  
Voice Transmitter  
Operator  
Television Technician  
Remote Control  
Operator  
Service and  
Maintenance  
Technician

**POLICE RADIO**  
Transmitter Operator  
Receiver Serviceman

## I TRAINED THESE MEN



### Handicapped but Successful

"I am now Chief Engineer at WHAW. My left hand is off at the wrist. A man can do... if he wants to." R. J. Bailey, Weston, W. Va.



### \$10 a Week In Spare Time

"Before finishing, earned as much as \$10 a week in Radio servicing, in my spare time. recommend NRI." S. J. Petrucci, Miami, Fla.



### Control Operator, Station WEAN

"I received my license and worked on ships. Now with WEAN as control operator. NRI course is complete." R. Arnold, Rumford, R. I.



### Trained Men Make Money in TV

"I am now servicing Television. Your course enabled me to repair TV receivers without any trouble." R. Currier, Fair Haven, Vt.



### Has Growing Business

"Am becoming expert Teletician as well as Radiotician. Without your course this would be impossible." P. Brogan, Louisville, Ky.



### Got First Job Thru NRI

"My first job was with KDRL. Now Chief Engr. of Radio Equipment for Police and Fire Dept." T. Norton, Hamilton, Ohio.

## Find Out What RADIO-TV Offers You



**SAMPLE LESSON  
and 64-PAGE BOOK  
Both FREE**

**Cut out and mail  
postage-free card today**

**FIRST CLASS**  
Permit No. 20-R  
(Sec. 34.9, P.L. & R.)  
Washington, D.C.

## BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed In The United States

**4c POSTAGE WILL BE PAID BY  
NATIONAL RADIO INSTITUTE**

**16th and U Sts., N.W.**

**Washington 9, D. C.**

## Make Extra Money While Learning

Keep your job while training. Many NRI students make \$5, \$10 and more a week extra fixing neighbors' Radios in spare time while learning. I start sending you special booklets that show you how to service sets the day you enroll. Multi-tester you build with parts I furnish helps discover and correct Radio troubles.



## Want Your Own Business?

Many N.R.I. trained men start their own business with capital earned in spare time. Let me show you how you can be your own boss... Robert Dohmen, New Prague, Minn., (whose store is shown at right) says, "Am now tied in with two television outfits and do warranty work for dealers. Often fall back to N.R.I. textbooks for information on installing Television sets."





# For faithful tone reproduction . . . high fidelity at low volume level — use Centralab's Compentrol



**PRICES**  
1/2 and 1 meg.—  
Plain Type \$2.50;  
Switch Type \$3.00

Switch type Compentrol shown above.  
Plain type at right.

*Centralab components are safest for guaranteed servicing*

**Y**OU can stake your service reputation on the Centralab Compentrol. That's because this combination volume control and Printed Electronic Circuit faithfully reproduces the high-pitched tones of the operatic soprano — or the deep bass notes of the boogie woogie beat . . . when volume is set at low level.

In fact, Compentrol was especially developed to better reproduce the apparent bass and treble response of radios, audio amplifiers, phonograph combinations and television sets. Use it as a business builder as well as for replacement service. It actually improves original performance! What's more, its low price will fit any pocketbook.

Because of its design CRL's Compentrol needs *no additional amplification*. There is no insertion loss when you use Compentrol.

The Centralab Compentrol is furnished in 1/2 or 1 meg.—plain or switch types. Switch is SPST, and an insulated switch shield is furnished for a-c shielding. Most amplifiers use a plain type. For complete details, ask your Centralab distributor, or use the coupon.

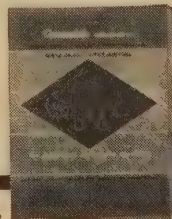
**Make your Centralab distributor  
headquarters for  
exact electronic replacements**

## Centralab

A Division of Globe-Union Inc.  
Milwaukee 1, Wisconsin

In Canada, 635 Queen Street East, Toronto, Ontario

The Centralab Compentrol is only one of the more than 470 *new* items listed in Centralab's new Catalog 28. Get your copy of this 32-page index to the latest developments in the fast-changing electronic field, plus a 16-page booklet telling the whole Compentrol story. See your distributor or use the coupon.



**CENTRALAB, A Division of Globe-Union Inc.**  
900 E. Keefe Ave., Milwaukee 1, Wis.

Please send me my copy of the new Compentrol Booklet as well as Centralab Catalog 28 at once and without charge.

Name.....Position.....

Company.....

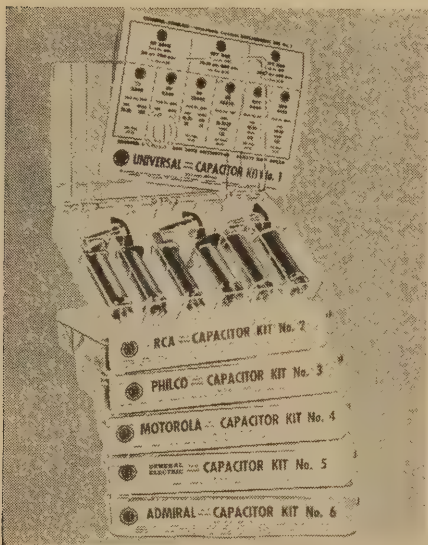
Address.....

City.....State.....



reported its recent *Tele-Mirror* promotion as one of the most successful yet undertaken by the Division, according to Edwin B. Hinck, sales manager for the Replacement Sales Department of the division. Based on the success of this campaign, similar promotions directed to the service technician will be forthcoming.

Cornell-Dubilier Electric Corp., South Plainfield, N. J., is giving away a useful clear plastic compartment case with the purchase of each of six new C-D Twist Prong Capacitor Kits. The see-through



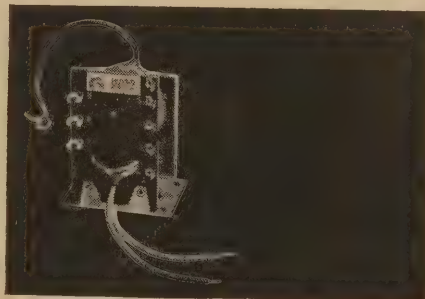
Merit's TV full-line offers the most complete line possible for universal replacement plus exact replacements where required. A new Merit TV Replacement Guide No. 405—including universal components and exact replacements for over 6000 models and chassis—can be obtained from your Jobber or by writing: MERIT COIL AND TRANSFORMER CORP., 4425 N. Clark Street, Chicago 40.

Merit IF-RF Coils include a complete line of TV replacements.



**MERIT FOR MAXIMUM COVERAGE  
WITH MINIMUM STOCK**

New in the Merit line of practical recommendations is the Model HVO-9 AUTOFORMER for exact replacement in RCA Hoffman and Hallicrafters. Designed for picture tubes 21" and up.



BURTON BROWNE ADVERTISING

compartments are ideal for storing screws, tubes and small parts of all kinds.

Allied Radio Corp., Chicago, in co-operation with the American Radio Relay League, distributed a free booklet, "You Can Be There," to radio clubs, classes, and other groups of radio or electronics students or hobbyists. The booklet tells the story of the romance which amateur radio operation offers young men.

RMS (Radio Merchandise Sales), New York City, conducted another in its series of forums for TV service technicians in Portland, Ore. The forum, which was co-sponsored by Pacific Stationery and Central Distributors, TV parts distributors, and arranged by the Burt Porter Co., RMS representative in the Pacific Northwest, emphasized u.h.f. antenna problems.

### Production and Sales

The RTMA reported that 3,670,591 TV sets and 6,689,535 radios were produced during the first nine months of 1952. The association pointed out that September, 1952, production of 755,665 TV sets was 124% over industry output for September, 1951.

Shipments of receiving tubes by members of the RTMA totaled 34,196,286, valued at \$24,432,747, a substantial increase over shipments for the previous month and for September, 1951. During the first nine months of 1952, 245,689,629 tubes were shipped, compared to

280,795,338 during the 1951 period.

General Electric Tube Department's manager of marketing, E. P. Peterson, Schenectady, predicted production of 6,200,000 TV sets during 1953, the highest since the record year of 1950. He said that 435,000,000 receiving tubes would be produced during 1953, as compared with an estimated total of 375,000,000 for 1952.

Westinghouse Television-Radio Division plant at Sunbury, Pa., reported an unprecedented high in employment and production figures. Employment figures were running 28% over the similar period of 1951; production topped last year's figures by 35%.

### New Plants and Expansions

CBS-Hytron, Danvers, Mass., is constructing an addition to its TV picture tube plant and large warehouse for TV picture tubes at Newburyport, Mass. The additions will enable the company to handle the production of 24- and 27-inch picture tubes in volume. The company expects that the construction of the new buildings will be completed by the middle of 1953.

Clarostat Manufacturing Co., Inc., Dover, N. H., opened an additional plant in the Chicago area. The new plant, now in operation, was purchased so that the company would be in a better position to serve its Midwest and Western customers.

Raytheon Manufacturing Co., Waltham, Mass., is constructing a new \$2,000,000 electronics laboratory in Bedford, Mass., designed to be one of the most modern and efficient of its kind. The new building is being constructed by Raytheon for the Navy and will be used by the company as a research and development center.

General Electric is now producing u.h.f. tuners for its TV sets at its Receiver Department plant, Auburn, N. Y. One hundred and fifty employees were added to the payroll to handle this new production.

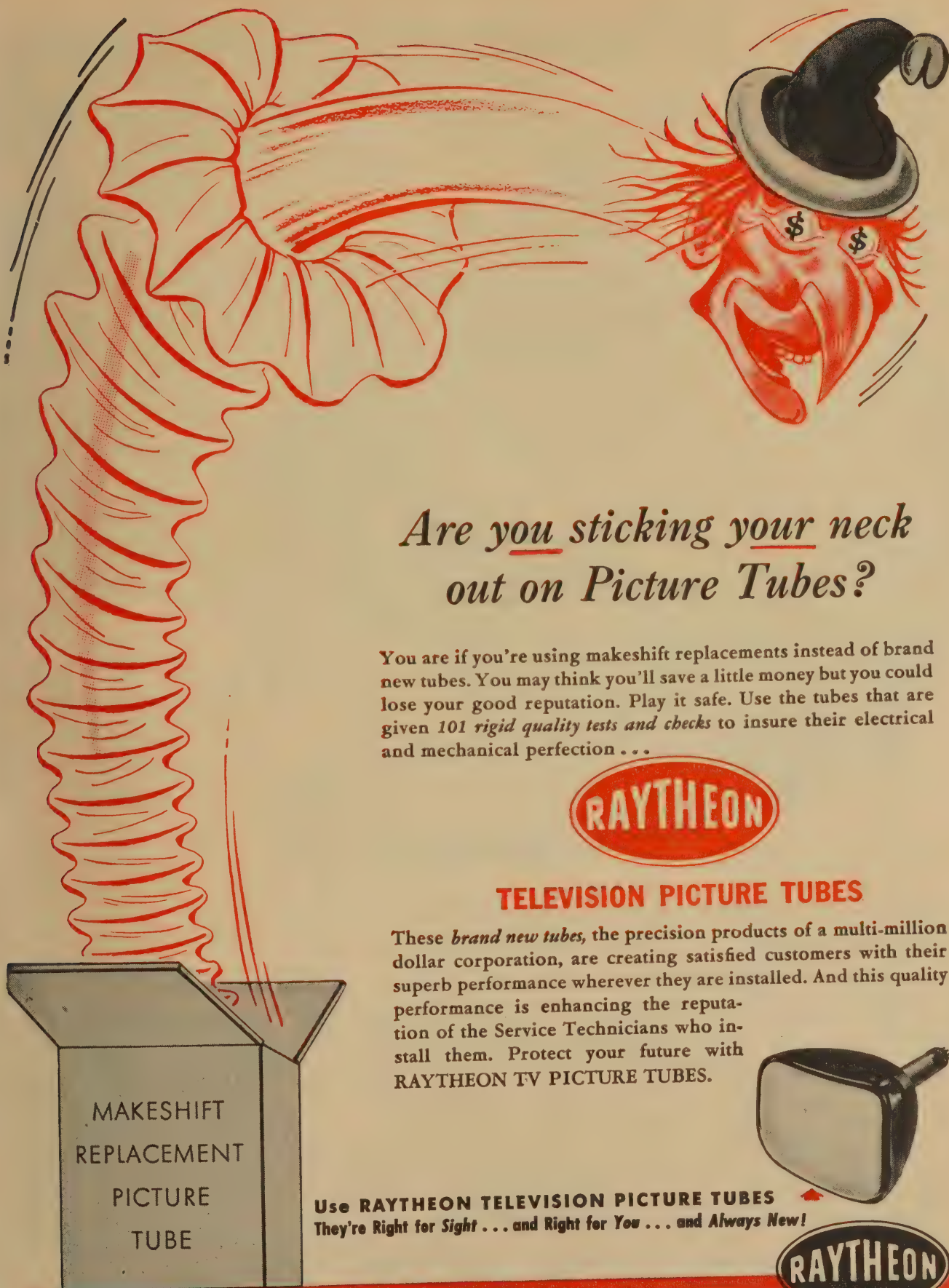
General Cement Manufacturing Co., Rockford, Ill., opened new warehouse facilities in Los Angeles to provide West Coast parts distributors and service technicians with better service and faster deliveries.

Synthane Corp., manufacturer and fabricator of laminated plastics for industry, added a two-story brick wing to its plant at Oaks, Pa. The new wing marks the eleventh plant expansion since the company's original factory was built.

Hammarlund Manufacturing Co., New York City, leased an additional 12,000 square feet of space at 541 W. 34th Street.

Radio City Products Co., New York City, moved all its test equipment production facilities to its Easton, Pa., plant. The Engineering, Sales, and Purchasing Departments and the general offices will remain in New York City. Walter Jonas, production manager, will direct operations at both plants. Burt Levy was appointed sales manager of the Jobber and Industrial Division. END





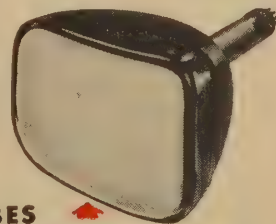
## Are you sticking your neck out on Picture Tubes?

You are if you're using makeshift replacements instead of brand new tubes. You may think you'll save a little money but you could lose your good reputation. Play it safe. Use the tubes that are given 101 rigid quality tests and checks to insure their electrical and mechanical perfection . . .



### TELEVISION PICTURE TUBES

These *brand new tubes*, the precision products of a multi-million dollar corporation, are creating satisfied customers with their superb performance wherever they are installed. And this quality performance is enhancing the reputation of the Service Technicians who install them. Protect your future with RAYTHEON TV PICTURE TUBES.



Use RAYTHEON TELEVISION PICTURE TUBES  
They're Right for Sight . . . and Right for You . . . and Always New!



**RAYTHEON MANUFACTURING COMPANY**

Receiving Tube Division

Newton, Mass., Chicago, Ill., Atlanta, Ga., Los Angeles, Calif.

RAYTHEON MAKES ALL THESE

RECEIVING AND PICTURE TUBES • RELIABLE SUBMINIATURE AND MINIATURE TUBES • GERMANIUM DIODES AND TRANSISTORS • NUCLEONIC TUBES • MICROWAVE TUBES



# SYLVANIA PICTURE TUBES

Lasted Longer than others tested!

"IT'S A TRUE  
BLUE-RIBBON  
TUBE"

BEST IN  
OVER-ALL  
POINT  
QUALITY!

SYLVANIA  
OUTLASTED  
ALL TUBES  
TESTED

**Only Sylvania tubes showed NO FAILURES  
after 1400 hours . . . at accelerated voltages**

Exhaustive tests conducted under the supervision of an outside impartial laboratory, the United States Testing Company, showed Sylvania Picture Tubes lasted longer than any others tested.

These tests included the picture tubes of nine leading manufacturers. All tubes were placed in identical test racks and tested under identical accelerated voltages. At the end of 1400 hours, only the Sylvania

Picture Tubes showed *no failures*.

These tests definitely establish the outstanding dependability of Sylvania Picture Tubes. They prove that these tubes will best uphold your reputation for fine performance in the sets you manufacture, sell or service. Send today for complete details about Sylvania Picture Tubes. Sylvania Electric Products Inc., Dept. 3R-1701, 1740 Broadway, New York 19, New York.

TESTS CONDUCTED  
BY U.S. TESTING  
COMPANY

# SYLVANIA

RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC  
PRODUCTS; ELECTRONIC TEST EQUIPMENT; FLUORESCENT  
TUBES, FIXTURES, SIGN TUBING, WIRING DEVICES; LIGHT  
BULBS; PHOTOLAMPS; TELEVISION SETS

RADIO-ELECTRONICS



Leonard C. Lane, B.S., M.A.  
President of Radio-Television  
Training Association, Exec. Dir.  
of Pierce School of Radio and  
Television.



## I GIVE YOU MORE EQUIPMENT TO TRAIN YOU BETTER

Set up your own home laboratory with the 15 BIG TV-Radio kits we send you. You build AND KEEP your own complete BIG SCREEN TV RECEIVER, Super-Het Radio Receiver, R.F. Signal Generator, Combination Voltmeter-Ammeter-Ohmmeter, C-W Telephone Receiver, AC-DC Power Supply. Everything is furnished complete, including all tubes, plus big TV picture tube.

THOUSANDS OF NEW JOBS IN

# TELEVISION

LEARN MORE!

I PREPARE YOU AT HOME IN YOUR SPARE TIME

## GET MORE! EARN MORE! MORE TRAINING TO FIT YOU FOR THE BETTER PAY JOBS

Thousands of new jobs will open up right in your own state, now that the government has lifted restrictions on new TV stations. My simple, successful methods have helped hundreds of men — most of them with NO PREVIOUS TRAINING — find places in America's booming TELEVISION and Electronics industries. You too can get the success and happiness you always wanted out of life within months... studying at home... as I train you to become a full-fledged TV TECHNICIAN. Many of my students make as much as \$25.00 a week repairing Radio-TV sets in their spare time while learning... pay their entire training almost from the very beginning from spare time earnings... start their own profitable service business.

But I don't stop after I qualify you as a TV Technician... although right there you can choose from among dozens of fascinating careers! I continue to train you — AT NO EXTRA COST — to qualify for even better pay in the BETTER JOBS that demand FCC licenses, with my...

## FREE FCC COACHING COURSE

PREPARES YOU AT HOME FOR YOUR FCC LICENSE.  
THE BEST JOBS IN TV AND RADIO REQUIRE AN FCC LICENSE.  
Given at NO EXTRA COST after TV Theory and Practice is completed.

## NOW! ADVANCED FM-TV TRAINING

If you have previous Armed Forces or civilian radio experience—my ADVANCED COURSE can save you months of training. Full theory and practical training... complete with kits, including BIG SCREEN TV RECEIVER and FREE FCC License Coaching Course.

## FREE EMPLOYMENT ASSISTANCE

My vocational adviser will help you obtain a good-paying job in the locality of your choice.

## RADIO-TELEVISION TRAINING ASSOCIATION

1629 Broadway, Radio City Station, New York City 19, N. Y.  
LICENSED BY THE STATE OF NEW YORK

## MORE VALUE!

YOU GET A ROUND TRIP TO  
NEW YORK CITY  
AT NO EXTRA COST

FROM ANYWHERE IN THE U.S. OR CANADA — I pay your way to New York and return, PLUS 2 FREE weeks, 50 hours of advanced instruction and shop training at the PIERCE SCHOOL OF RADIO & TELEVISION. You use modern electronics equipment, including student-operated TV and Radio stations. You go behind the scenes of New York's big Radio-TV centers, to study first hand. And I give you all this AT NO EXTRA COST! (Applies to complete Radio-TV course only.)

Only RTTA makes this amazing offer.

## I GET MY GRADUATES GOOD PAYING JOBS

"Thanks to your training, I qualified for a good job as a Receiver Tester at Federal Telephone and Radio."  
— Paul Frank Seier



"I'm making good money in my own business, repairing and installing radio and TV sets — thanks to your training."  
— Irwin Polansky



"Your excellent instruction helped me get my present job as an airport radio mechanic for American Airlines."  
— Eugene H. Basko



"I'll always be grateful to your training which helped me get my present fine position as Assistant Parts Manager."  
— Norman Weston



Many others working at NBC, RCA, CBS, DuMont, Philco, Emerson, Admiral and other leading firms.

# VETERANS!



MY SCHOOLS FULLY APPROVED TO TRAIN VETERANS UNDER NEW G.I. BILL! If discharged after June 27, 1950 — CHECK COUPON BELOW!

Also approved for RESIDENT TRAINING in New York City... qualifies you for full subsistence allowance up to \$160 per month.

## MAIL COUPON TODAY!

BOTH FREE! New Illustrated Book and Sample Lesson. Learn How My Simple Methods Make Success Easy!



## NO SALESMAN WILL CALL!

Mr. Leonard C. Lane, President  
RADIO-TELEVISION TRAINING ASSOCIATION  
1629 Broadway, Radio City Station  
New York 19, N. Y.

Dept. R-1

Dear Mr. Lane: Mail me your NEW FREE BOOK and SAMPLE LESSON that will show me how I can make BIG MONEY in TELEVISION. I understand I am under no obligation and no salesman will call.

(PLEASE PRINT PLAINLY)

Name \_\_\_\_\_ Age \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

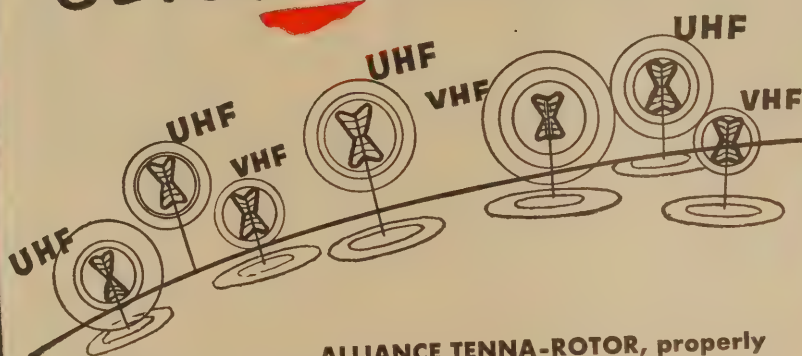
I am interested in: ☐ Radio-TV ☐ Advanced FM-TV.  
VETERANS: If qualified under new G.I. Bill, check your choice: ☐ Home Study ☐ Resident Study.





# HERE'S WHY ALLIANCE TENNA·ROTOR IS THE ANSWER TO UHF RECEPTION!

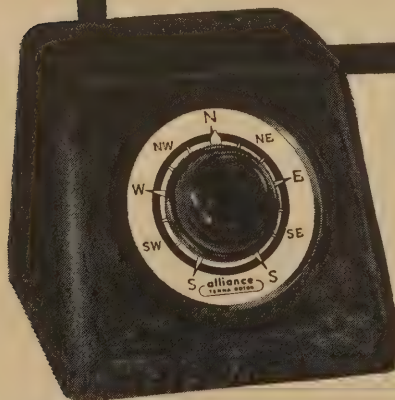
## ONE ANTENNA GETS ALL STATIONS!



ALLIANCE TENNA-ROTOR, properly installed, on one directional antenna, assures top gain from all stations—UHF and VHF.

- **UHF is more critical—highly directional!**  
Tenna-Rotor is accurate—pin-points the antenna—puts it right on the beam!
- **Many channels are changing!\***  
Tenna-Rotor gives directional all-channel reception—stops costly antenna alterations and re-alignments.
- **Make ONE antenna installation the final installation!**  
It pays to insist on Alliance Tenna-Rotor!

Weather-sealed rotator unit



Automatic HIR with direction indicator control. Price \$44.95

### IMPORTANT NOTICE!

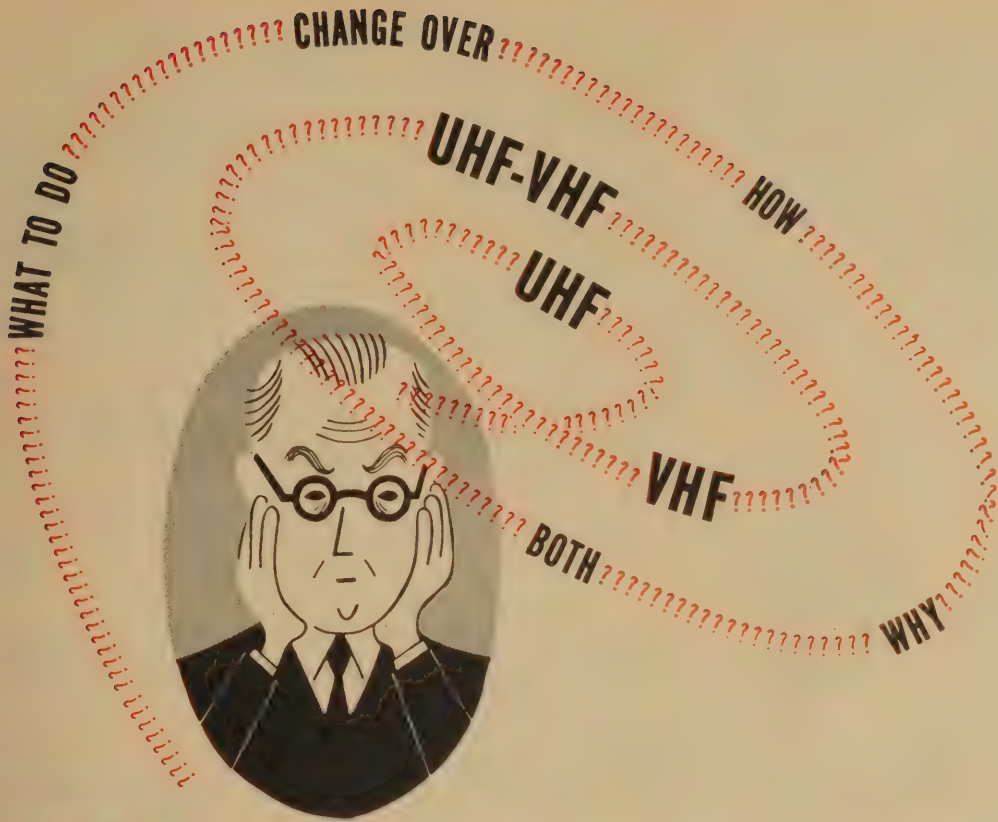
\*Changes in television demand changes in present antennas! New UHF and VHF stations mean more channels! Current FCC rulings have assigned channel changes to nearly one-third of all VHF stations. This makes single-channel antennas and other fixed position antennas obsolete! Prepare now. Meet the coming changes in television with ALLIANCE TENNA-ROTOR.

Sold by  
TV Dealers  
Everywhere

**alliance**  
**TENNA·ROTOR**

(TV ANTENNA ROTATOR)





**WARD** antennas have all the UHF-VHF answers!

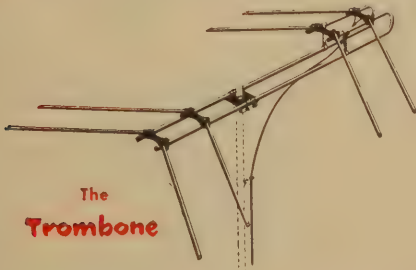
### UHF only for old installations

The New  
Jazz Trombone



Add it to present VHF installations and you have a complete UHF-VHF Antenna . . . covers all UHF channels with high gain . . . small, neat and pre-assembled. JAZZ TROMBONE is the first new UHF only antenna . . . an exclusive WARD development.

### UHF-VHF for new installations



The  
Trombone

Here is the sensational, new WARD Antenna that brings in all-channels, all-frequencies—both VHF and UHF—with one single Antenna . . . the completely universal WARD TROMBONE. For new installations nothing compares with WARD TROMBONE.

#### THE DIPLEXER



This brand new WARD item completely solves the problem of lead-in lines, where separate UHF and VHF Antennas are employed. Simply attach the two lines to THE DIPLEXER and extend one single line from the DIPLEXER to the TV receiving set.

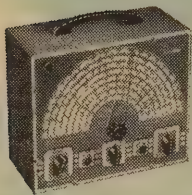


**THE WARD PRODUCTS CORP.**

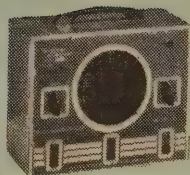
DIVISION OF THE GABRIEL COMPANY

1148 Euclid Avenue • Cleveland 15, Ohio In Canada: Atlas Radio Corp., Ltd., Toronto, Ont.

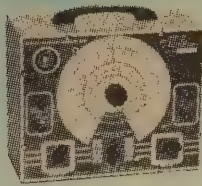




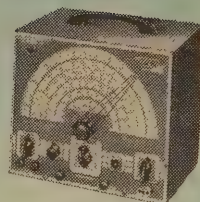
320K SIG. GEN.  
KIT \$19.95 WIRED \$29.95



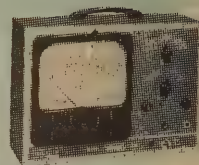
145K SIG. TRACER  
KIT \$19.95 WIRED \$28.95



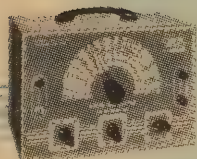
950K R-C BRIDGE &  
R-C-L COMP. KIT \$19.95  
WIRED \$29.95



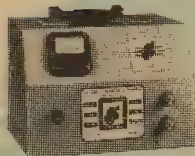
360K SWEEP GEN.  
KIT \$34.95 WIRED \$49.95



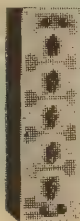
**New** 214K VTVM KIT  
\$34.95 WIRED \$54.95  
7 1/2" METER



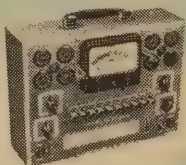
**New** 377K SINE & SQUARE  
WAVE AUDIO GEN. KIT \$31.95  
WIRED \$49.95



1040K BATTERY ELIM.  
KIT \$25.95 WIRED \$34.95



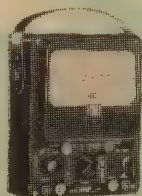
1171K RES. DECADE BOX  
KIT \$19.95 WIRED \$24.95



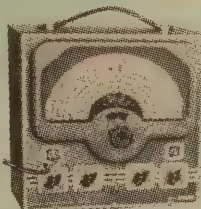
625K TUBE TESTER  
KIT \$34.95 WIRED \$49.95



CRA PIX TUBE ADAPTOR  
for Tube Tester \$4.50



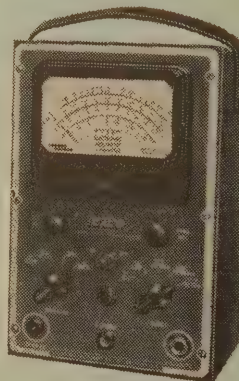
**New** 565K MULTIMETER  
KIT \$24.95 WIRED \$29.95  
20,000  $\Omega/V$ ; 31 ranges



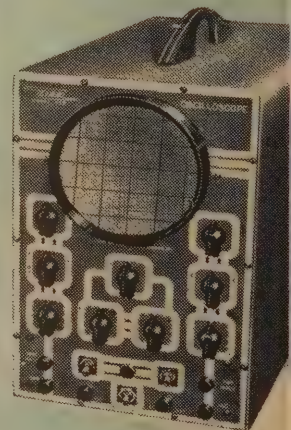
315K DELUXE SIG. GEN.  
KIT \$39.95 WIRED \$59.95



HIGH VOLTAGE  
PROBE \$6.95



221K VTVM \$25.95  
WIRED \$49.95

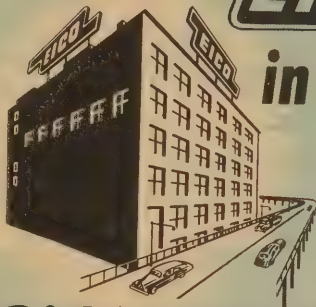


425K 5" PUSH-PULL SCOPE  
KIT \$44.95 WIRED \$79.95

OVER 1/4 MILLION

**EICO** INSTRUMENTS

in use the world over!

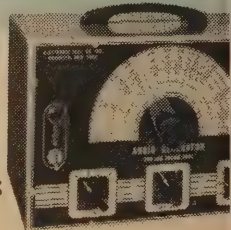


**EICO** new modern facilities for research, development and production—your greater assurance of . . .

**LABORATORY PRECISION AT LOWEST COST**

**NEW AUDIO GENERATOR**

- **Accuracy:**  $\pm 3\%$
- **Sine Wave Range:** 20-200,000 cps in 4 bands
- **Square Wave Range:** 60-30,000 cps
- **Freq. Response:**  $\pm 1.5$  db, 60 cps-150 kc.
- **Output Voltage:** 10 volts across 1000 ohms (rated load); 14 volts across 10,000 ohms; 8 volts across 500 ohms
- **Distortion:** less than 1% at rated output (100 mw)
- **Hum:** less than 0.4% of rated output
- Clear, three-dimensional drawings and simplified construction information. 15-page Instruction Book describes circuitry, applications and maintenance.



377K  
KIT \$31.95  
WIRED \$49.95

**You Build EICO Kits in One Evening, but . . . They last a Lifetime! and You SAVE OVER 50%**

YOU be the judge. See the famous EICO line TODAY — in stock at your local jobber — and SAVE!

**Write NOW for FREE newest Catalog 1-CA.**

America's greatest instrument values bear the name—

**EICO**

See EICO's other ad on Inside Back Cover of this magazine.

ELECTRONIC INSTRUMENT CO., Inc., 84 Withers Street, Brooklyn 11, N. Y.



# NEW TELEVISION TRENDS

*Vital new developments in television . . .*

By HUGO GERNSBACH

IT NOW BECOMES apparent that television, as far as entertainment is concerned, will take a distinctively new road in the near future. With a few exceptions, radio broadcasting in the past made it possible for listeners to receive almost every imaginable program that could be broadcast. (These few exceptions were primarily major prize fights which were *not* broadcast because the promoters felt that their gate receipts would suffer.)

With television, broadcasting no longer is blind. The promoters of sports, Broadway shows, operas, and similar events are convinced that television would be a far-too-powerful competitor if such entertainment were broadcast free of charge.

I foresaw this situation 20 years ago in an article entitled "The Tele-Theater" in the January-February 1932 issue of my former publication, *TELEVISION NEWS*. This situation was amplified in an editorial entitled "The Tele-Theater" in the January 1951 issue of *RADIO-ELECTRONICS*. It is now no longer news that recently important sports events have been televised exclusively to theater chains in various parts of the country, where admission is charged to view the event.

As this issue of *RADIO-ELECTRONICS* goes to press, the first closed circuit telecast of Metropolitan opera is about to be shown in a number of theaters in the U.S. (December 11th.)

To expand its activities, as well as its income, the Metropolitan Opera Association, Inc. arranged to have the entire opera "Carmen" broadcast in conjunction with the *Theatre Network Television, Inc.* This particular telecast runs for more than three hours, and takes in the entire opera from beginning to end. Over 30 theaters in the principal cities from coast to coast signed up as participants in this trial event. The price scale in each theater was determined by local management, but it was stressed that the tickets were sold at reasonable prices. The Metropolitan Opera Association, Inc. shares in the returns from the theaters on a percentage basis.

It appears certain that important Broadway plays will soon follow this innovation. The trend is bound to follow this particular pattern, and it looks as if the teletheater is with us to stay, for a long time to come.

At present it would probably not pay sponsors to offer free broadcasts to the televiewing public of Broadway plays, grand opera, and other important entertainment events. It will be possible, however, in the future, when there are as many television sets as radio receivers in the country.

The question has been frequently asked: "Where does the private television set owner fit in this type of arrangement?" At the moment he simply is not being considered at all, for the simple reason that the new trend is away from *broadcast* television. It is a *private* endeavor of a group of entrepreneurs bent on filling their theaters which have been more or less emptied by the terrific competition of broadcast television.

Fortunately, the television owner may not always be barred from seeing a Metropolitan Opera broadcast, or a

Broadway play broadcast, *in his own home*. Once more science is coming to the rescue. Indeed, it may be quite possible that in a few years a television owner may not have to go to his local theater to see an important Metropolitan Opera. My editorial, "Magnetic Tape TV Recording," in the November 1952 issue of *RADIO-ELECTRONICS*, pointed out that it will soon be possible to record television programs on a magnetic tape. When the final bugs have been eliminated, the way will be open for a central distributing agency to sell magnetic television recordings or rent reels of important productions—the Metropolitan Opera included—to everybody in the land. All that the home television owner will need is a special television tape reproducer which can be put on top of or near the television receiver and connected to its circuits without disturbing it. Then by merely pressing the switch the recording will reel off and the action will appear on the screen.

It should be possible to mass-produce the magnetic tapes at a reasonable price so that play or opera performances can be sold or rented at a reasonable rate. Quite possibly Broadway producers and opera companies will realize even more money thus than from theater television. If only 25% of the television set owners would subscribe to the tape service, it would work out to a very substantial figure, exceeding the amount paid by the theaters many times. At this moment it is anyone's guess how much the magnetic tape reels will be sold or rented for.

Naturally, the television set owner still would have to pay a fee to participate in such an entertainment setup, but it is quite probable that most people would not object to this.

In the meanwhile, new owners of television sets will have little to complain about because the price of television receivers is continuously going down. This is also a well-defined trend. Already several of the large television manufacturers are selling high-grade 21-inch-screen sets below \$200, which is an important reduction from former price levels for similar sets.

Indeed, the lower prices will probably continue for quite a while. With new engineering techniques, such as transistors, appliquéd—the so-called plated-circuits, it will be possible in the future to make still greater price concessions. The reason is that in television sets the labor cost is a very appreciable portion of the total manufacturing cost of the receiver. With the appliquéd circuits, the cost can be reduced still more. It therefore would appear that 21" screen and larger sets selling around \$150 and less are not at all impossible within the next few years.

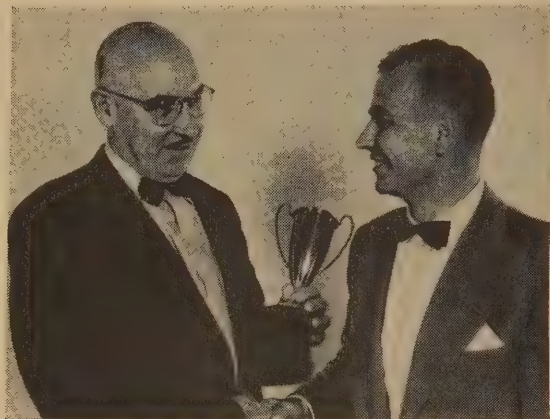
This trend is in the right direction because it paves the way for color television. At one time it was thought that a good color television receiver would cost between \$400 and \$500, but in the light of new techniques it would appear that when and if color television sets are marketed, they will probably sell for between \$200 and \$250, and perhaps even lower.

Most likely these sets will also include magnetic tape equipment to view—at a cost—Broadway shows, operas and other closed circuit features not normally broadcast.



# UHF OPENS UP

By **RAYMOND F. GUY\***



The author, left, congratulates Victor Bary on the record Portland installation.

**M**OMENTOUS events, of deep significance to the readers of **RADIO-ELECTRONICS**, are taking place in television. In the May, 1952, issue, an article by this author outlined the "TV Pattern for the Future", based upon events, developments, and trends immediately prior to the lifting of the television freeze. That long-awaited event is now history, and already the Federal Communications Commission is well advanced on its program of authorizing television station construction permits. Initiation of TV service in scores of communities is now imminent, millions of new receiver installations will be necessary, and the readers of these pages will be vitally concerned with the installation and servicing of these receivers. It is again timely to look to the present and future responsibilities and opportunities placed before you.

Following a number of years of basic research and investigation of u.h.f. wave propagation and the development of tubes and circuitry, the Radio Corporation of America and the National Broadcasting Company on December 29, 1949, placed in operation in the Bridgeport-Stratford (Connecticut) area their historic experimental station KC2XAK, the u.h.f. pathfinder for the industry. On August 23, 1952, this station signed off for the last time. Within four days, the antenna, tower, and apparatus had been completely dismantled and were on the way to Portland, Oregon.

Within 60 hours of its arrival at Portland, it had been installed on a hill-top site recommended by this writer and was ready to render the first TV broadcast to Portland. Within a few days the FCC granted special temporary authorization for the service to start and thus the Bridgeport veteran transmitter embarked on a new career in virgin territory as the world's first commercial u.h.f. TV station, bringing TV for the first time to nearly 1,000,-

000 people. Only about three weeks from the time the apparatus was signed off at Bridgeport, it began commercial operation in a city 3,000 miles away.

The excitement and impact of this momentous event in Portland and throughout the industry beggars description. Transcending all other topics of local conversation and news, it established a precedent which others will strive to equal, perhaps in your community. Coming unexpectedly soon, the rush to acquire receivers and converters sparked off crash programs among the manufacturers, distributors, dealers, and service companies to rush equipment to the area and meet the demand. During the first three months of TV service in Portland, it was anticipated that at least 60,000 receivers would be purchased and installed without substantially blunting the sharp edge of the feverish demand. In one large store alone, a million dollars worth of receivers were sold in 10 days and list prices are the order of the day.

What happened in Portland may happen in your community. The press and radio gave almost hourly bulletins on the activities at Council Crest Park where the new TV station was being built. Local columnists speculated with every new edition as to the probable opening date for the station. A contest was held—with a new TV set as a prize—for the citizen who most closely guessed the day, hour, and minute that the station would officially open. People from all over the area flocked by the thousands to the transmitter site to see their first TV station being built. All available parking space was filled and workmen engaged in the project in some cases had to park a quarter of a mile from the site. During the early afternoon hours a police detail was assigned to the area to regulate traffic and at times had to conduct sightseers in large groups on 20-minute cycles to give all of the sidewalk superintendents a view of the proceedings.

TV's debut in Denver was equally exciting. Eleven days after the FCC

started on July 1 to make post-freeze grants, a construction permit was issued to KFEL-TV. Only one week later special temporary authority was granted by the FCC to begin telecasting, which was inaugurated within three days with an immediately available v.h.f. 500-watt RCA transmitter.

Television service thus has come with startling rapidity to the two largest markets heretofore without it. The imagination and enterprise which accomplished it will also bring it to many other communities in like manner. It is to your interest to keep informed and be prepared to take advantage of the opportunities it may present to you.

## FCC processing procedure

When will your community receive TV service or an extension of your present service? Unfortunately it is not possible to publish an explicit timetable. But it is possible to inform you of trends and possibilities.

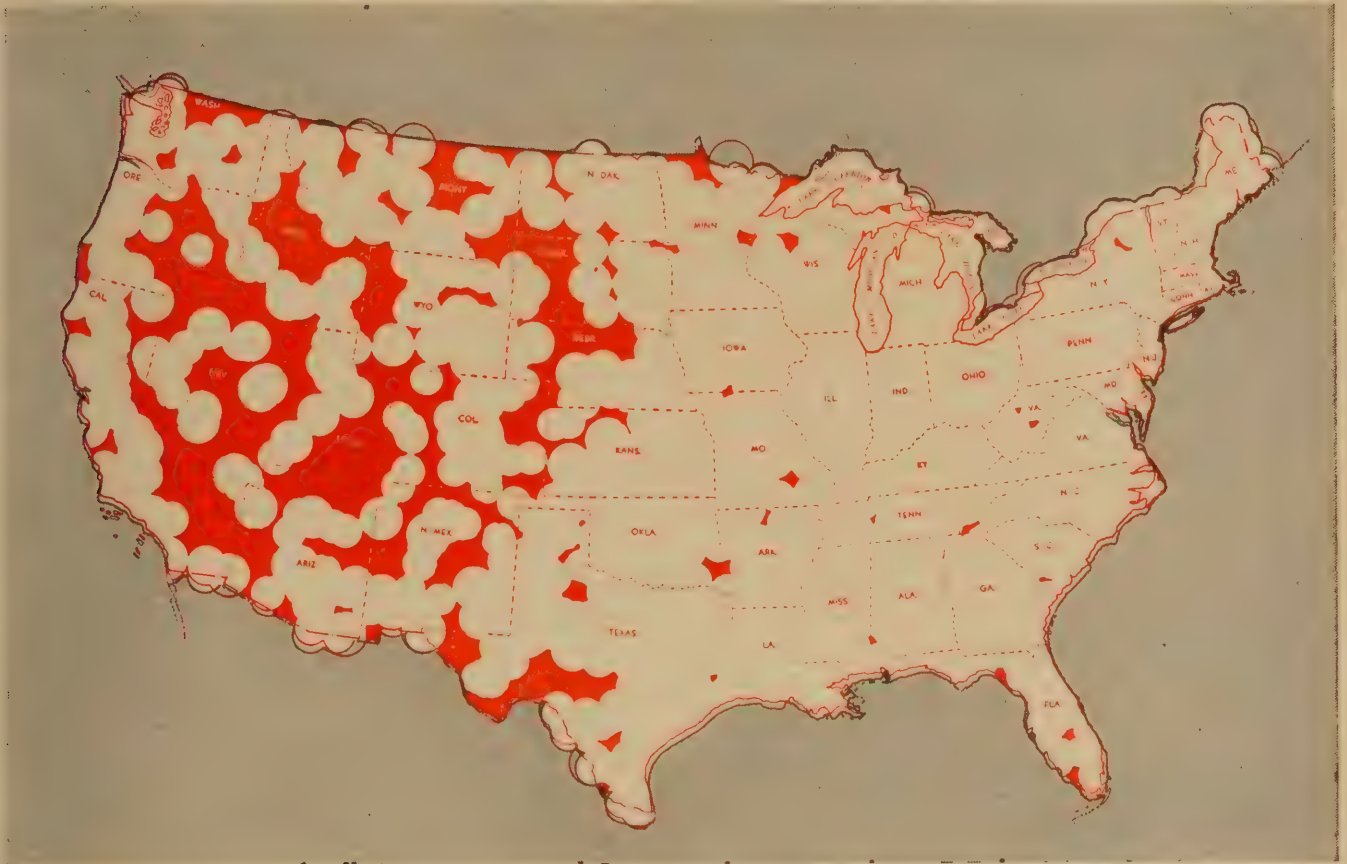
When preparing its Sixth Report and Order (the TV thaw-out) of April 14, 1952, the Commission was faced with a truly monumental task in processing the hundreds of applications for station grants. Having adopted voluminous standards and rules as the framework for the great nation-wide service of the future, how could they best proceed with the granting of applications with promptness, fairness, and efficiency? In hundreds of cases an individual channel in a given community would be applied for by not only one but many different applicants. Under our democratic processes in such cases, public hearings are indicated to enable the FCC to determine which of the applicants is best qualified to serve the public interest, convenience, and necessity. Some of these cases apply to cities with existing service and others do not. In some instances, there would be but one applicant for a channel. In other cases, existing stations require only a change of frequency to conform with the new allocation plans.

(Continued on page 32)

\*Manager, Radio and Allocations Engineering, National Broadcasting Company, Inc.



POSSIBLE V. H. F. AND U. H. F. TV COVERAGE AS ESTIMATED LAST YEAR



EXTENT OF POSSIBLE TV COVERAGE ACCORDING TO PRESENT STANDARDS





Complex and difficult legal problems and lengthy procedures were involved.

The objective was to make television service available to the greatest number of people in the shortest possible time. Obviously it could not be done by processing applications in the order in which they were received, because uncontested applications from unserved areas would have had to await the completion of time-consuming hearings involving competitive applications (in many instances from large cities already well served). For many weeks prior to the April thaw, the Commission roughed out tentative processing procedures and priorities, with co-operation from the FCC Bar Association and the Society of Federal Communications Consulting Engineers. When the 3½-year freeze ended on April 14, 1952, the plan was ready.

Applicants were given until July 1 to submit new applications and amend old ones before any grants would be made. A number of procedural simplifications were adopted to save time and speed up the processing, and the following temporary priority system was established:

#### Priority A 1

The 30 existing stations which, under the new allocations plan, will be required to change their channel frequencies to reduce interference. These stations were listed in "TV Pattern for the Future" in the May issue of RADIO-ELECTRONICS. WKY-TV, Oklahoma City, is omitted in the new list.

#### Priority A 2

New stations in cities 40 miles or more from any existing TV transmitter. In other words the Commission will concentrate on providing service to unserved areas. (Portland, Ore., and Denver, Colo., are examples.)

#### Priority B 1

Stations for communities where only u.h.f. channels are allocated and where the separation may be less than 40 miles from an existing transmitter (excluding educational stations).

#### Priority B 2

U.h.f. stations for communities where all possible v.h.f. channels are in operation.

#### Priority B 3

Stations for cities having no service and which may be less than 40 miles from not more than one existing station.

#### Priority B 4

Stations for cities having only one existing station and which are 40 miles from any other TV transmitter.

#### Priority B 5

Stations for cities less than 40 miles from any two or more existing transmitters.

With 491 new applications on file on

July 1, 1952, the Commission commenced the processing of the "post-freeze" applications for new television broadcast stations. Scores of competitive applications were designated for hearing and nearly 200 additional applicants were advised that their applications were competitive with others. In September the Commission announced, that, because of the limited number of examiners and other staff members engaged in hearing work, it would not have been possible to try such cases until the existing backlog was removed, and no useful purpose would have been served by designating additional applications for hearing them.

For this reason the interest of parties who had filed or who would file competitive applications would not have been adversely affected by the processing of only noncompetitive applications, for a time. It is likely that the hearings in the cases now designated for hearing and those additional competitive applications already processed by the Commission will not be concluded for a considerable period.

The Commission will continue to process noncompetitive applications in the order of priorities set forth. If mutually exclusive applications are amended so as to remove the conflict, the Commission will consider such applications at that time. The Commission will re-examine its backlog of hearing cases from time to time. When it appears that Commission personnel will be available for handling additional cases, the Commission will resume the processing of competitive applications. With the elimination, for the time, of competitive applications in favor of noncompetitive ones, many cities will receive grants much more quickly.

#### Small communities

Can small communities have TV stations? 835 cities, about 60 percent of the total list of 1,430 in the FCC assignment plan, have populations of 25,000 or less. Already, over 60 applications for stations in these communities are on file. The existing list of such grants will grow quickly.

The interests of the small communities have been well protected by channel assignments. Nearly 500 communities of less than 10,000 population are allocated one or more channels. Over 300 communities of less than 25,000 but more than 10,000 population are provided for.

#### Grades of service

U.h.f. is new to practically all service technicians. Terrain irregularities create greater losses and much more severe shadow areas in the ultra-high-frequency band than in the very-high-frequency channels. These effects do not occur abruptly. There is a gradual change as the frequency increases, starting with the lower frequencies of channel 2 and continuing on up to the top of the u.h.f. band. The FCC has attempted to take account of this

change by authorizing higher power at the higher frequencies. Channels 2 through 6 will be limited to 100 kw effective radiated power, 7 through 13 to 316 kw, and all u.h.f. to 1,000 kw. These power differentials are intended to equalize the service radii of the various stations, and take into account the increased signal intensities needed at the higher frequencies to provide equivalent picture quality and freedom from noise and interference.

In standard broadcasting at 540 to 1600 kc, the primary service range of a station may be expressed with relative simplicity because the field intensity falls off at a fairly uniform rate, with large fill-in behind hills and obstacles. But with increasing frequency, fill-in diminishes and local scattering effects increase. These random effects are far more noticeable at v.h.f. and are severe at u.h.f. Therefore the local field intensities vary widely, depending on terrain conditions. For this reason the service ranges for television stations are expressed in statistical terms to more nearly reflect actual conditions.

Two grades of television service are recognized in the new rules and standards:

#### Grade A service

Grade A service is so specified that a quality acceptable to half the people (the median observer) is expected to be available for at least 90% of the time at the best 70% of receiver locations at the outer limit of this service. Expressed in terms of microvolts per meter Grade A service requires:

Channels 2-6	Channels 7-13
2,500	3,850
Channels 14-83 (u.h.f.)	
5,000	

#### Grade B service

Grade B service differs from Grade A in that the acceptable quality would be obtainable at only 50% of the locations instead of 70%. The field intensities in microvolts per meter are shown below for Grade B:

Channels 2-6	Channels 7-13
224	630
Channels 14-83 (u.h.f.)	
1,585	

#### Service ranges

When these grades of service are expressed in miles distance it becomes possible for the service technician to evaluate roughly the service he may expect in his area. Judging by the many and continuing requests received by this author from service organizations, dealers, and others for information on TV service ranges, this information may be of value. The tables at the right represent average values based upon FCC's methods of interpretation. The actual radii may vary widely downward, particularly in the u.h.f. channels, if terrain conditions are poor.



## Antenna installations

Locating the u.h.f. receiving antenna will require more care than for v.h.f. in the marginal areas. In v.h.f. an increase in antenna height will normally produce higher field intensity and improve the margin of signal over noise levels. But, while the same relationship applies *on the average* over a large number of u.h.f. installations, the voltage picked up may vary widely and at random in individual cases. An increase in height may actually reduce the signal level. And large variations may occur with horizontal movement.

During the Bridgeport investigations, careful studies were made at 91 typical residential locations to determine the average variation of signal intensity as the antenna was moved horizontally at a 30-foot height. The movement was over a range of only about 5 feet in most cases, to cover several wavelengths. The maximum and minimum values of intensity were recorded and analyzed. At 20% of the locations the displacement over these few feet produced variations of more than 2 to 1. At 10% of the locations it produced variations of 3 to 1. At 5% of the locations it produced variations of 4 to 1. And in one location it was 7 to 1!

The optimum antenna locations for u.h.f. are relatively unpredictable and the service technician who is thorough and conscientious may find it necessary to explore for them while communicating with an observer at the receiver.

Flat or tubular plastic transmission line has very low losses when properly routed and dry. But it should be isolated from nearby metallic objects such as pipes, which change its characteristics markedly at u.h.f. It should be sheltered from rain and sleet if losses are of importance.

## Frequency shifts

The frequency shifts which are scheduled for 30 stations previously referred to have in many cases been covered by applications and grants. The Commission proposes to permit the stations to work out the time schedules for the shifts at their own convenience, if possible. The schedules will be determined by procurement problems and most will take place early in 1953. Several were made in 1952.

## New station grants

At the time of writing the number of applications for station construction permits on file was rapidly approaching 1,000. Of these, about 60% are for v.h.f. and the other 40% for u.h.f. grants. The total number of grants made since the Commission started processing is well over 100, of which about 80% are for u.h.f. stations.

Prior to revising its processing routine, the Commission granted an average of 1 construction permit per week for v.h.f. stations, and 5 per week for u.h.f. stations. If this rate were continued through 1952, the year-end total of new station grants would be 25

Transmitting Antenna Height in Feet		Grade A Service Radii (in miles) for Powers Shown (Effective Radiated Power)					Grade B Service Radii (in miles) for Powers Shown (Effective Radiated Power)				
		1 kw	10 kw	100 kw	316 kw	1,000 kw	1 kw	10 kw	100 kw	316 kw	1,000 kw
300	Ch 2-6	7	12	21	28		22	35	50		
	Ch 7-13	7	12	21	28		17	28	40	45	
	Ch 14-83	5	9	15	20	26	9	15	26	31	40
500	Ch 2-6	9	16	27			28	43	57		
	Ch 7-13	9	16	28	35		22	35	46	52	
	Ch 14-83	6.5	11.5	20	25	23	11.5	20	32	40	47
700	Ch 2-6	11	19	31				47	63		
	Ch 7-13	11	20	34	40			40	50	57	
	Ch 14-83	8	13.5	23	30	37		23	37	45	52
1,000	Ch 2-6	13	23	37			39	54	70		
	Ch 7-13	13.5	25	40			33	46	57	63	
	Ch 14-83	9	16.5	28	35	43	16.5	28	43	50	59
2,000	Ch 2-6	19	34	50			52	69	86		
	Ch 7-13	21	40	54	61		47	61	74	80	
	Ch 14-83	13	24	41	49	57	24	41	57	65	74

v.h.f. and 125 u.h.f. grants, or a total of 150. This author expects this total to be met and possibly exceeded because of the revised processing schedule. The accelerated processing may result in a large increase in the number of v.h.f. grants, if there are included power increases for existing v.h.f. stations in the lower priority categories.

## New stations

Using temporary equipment, station owners in Denver and Portland have created brilliant examples of what can be done to establish service quickly. But transmitting equipment is not available to permit wide-scale duplication of these feats. On the basis of plans which many grantees have disclosed, we may expect to see about 12 more stations before the end of 1952, most of them in new television areas. Based upon similar information, 35 may be added in the first half of 1953, many of these also in new TV cities. From that point on, plans now being made will come to fruition with more rapid increases in the rate of new starts. Barring critical material complications it is estimated that 150 new stations may be added in 1953, frequency changes will be completed at the 30 stations slated to switch channels, and power will be increased by most of the existing 109 v.h.f. stations, if permitted.

Your writer believes that by the end of 1954 there may be 400 new stations; by the end of 1955 over 600, perhaps half in presently unserved cities; by 1956 750; and by 1957 possibly 1,000 or more.

## Possible national service

In "TV Pattern for the Future" in the May issue a map was published showing the extent of possible national TV service from the combined u.h.f. and v.h.f. stations, with powers and standards *originally* proposed by the FCC. But those actually adopted went further than had been contemplated. The accompanying map shows the extent of the total possible service areas of all TV stations listed in the FCC allocation plan, utilizing the maximum powers now permitted and judging by the Commission's criteria for gauging the service areas. If these criteria are sound, the entire United States, ex-

cepting only the areas shown in color, could be given TV service.

Because of economic problems such a degree of service cannot be realized for a long time. The very small communities cannot support a television station, and particularly a station of maximum power. But when and if the time comes that a service can be supported, the spectrum space and the channels will be available. TV will not be handicapped by the saturation and lack of channels which have through the years prevented so many small communities from having standard broadcasting primary service.

There has been much discussion and speculation concerning the minimum size of a community necessary to support its own TV station. Estimates of 25,000 to 100,000 population frequently have been mentioned. There is evidence that it can be accomplished successfully at 25,000. It is this writer's opinion that the demand for TV is so great that people would pay almost any amount within reason to have it, and that the figure of 25,000 will shrink considerably as the ingenuity and resourcefulness of our industry is applied to the solution of this problem, which is altogether one of economics.

## Installation and servicing

Denver and Portland were unprepared for the demand for receivers and technical service. Both receivers and service technicians were rushed in—the technicians to help with the overflow with which the local service companies were swamped. In all probability it will happen again elsewhere because the avalanche of demand in new TV cities comes almost overnight. Interest in and desire for TV have been whipped to a sharp edge and an overwhelming ready-made demand exists in all unserved communities.

TV receivers are relatively complicated instruments. Few owners attempt to build or maintain them, fortunately. But they are an essential, indispensable part of the TV system which starts in the camera tube and terminates in the home kinescope. You, Mr. Service Technician, have the responsibility for your part of the system! Its proper discharge will keep you on your toes and pay you well when "T day" comes to your community.

END



# TV DISTRIBUTION SYSTEMS

"Master antenna systems" are increasing in both importance and use

By ERIC LESLIE



The Electro-Voice 3100 has outputs for four receivers and a second unit.

FROM the earliest days of television, owners, dealers, and service technicians have needed some way of connecting two or more sets to an antenna. Two-set and larger *distribution systems* were soon worked out. These were originally rather crude and wasteful of the precious signal, but have so developed that today almost any number of receivers can be operated as part of a distribution system, and a signal of any desirable level can be applied to their inputs.

Earliest and simplest of all distribution systems is a simple resistor network. It matches the input impedance of the receiver to the line and isolates one receiver from another by the attenuation of the resistors. Fig. 1 is a diagram of a typical system. If signals are strong enough, more than two receivers may be connected by choosing the resistors so that the parallel

resistance of all the branches is 300 ohms. Thus for three receivers, the resistors on each side of the receiver inputs would be 300 ohms each, giving us three 900-ohm branches which have a parallel resistance of 300 ohms.

Such systems work reasonably well in strong-signal areas, where some signal attenuation may be a good thing rather than the contrary. But energy is wasted. Even in a two-receiver set-up half the signal is dissipated in resistors, and the proportion is increased with the number of receivers. A less wasteful method is needed even for moderate-signal areas.

A number of systems using methods similar to r.f.-transformer or impedance coupling were next to appear. Of these, possibly the Brach two-set *Mul-Tel* coupler is the best known. The antenna is divided into two artificial lines, as shown in Fig. 2. The correct

impedances are approximated by bifilar windings, which also act as a high-pass filter, shorting out interference below about 50 mc.

Interaction between receivers is reduced by impedance mismatch. The antenna looks into a matched 300-ohm impedance, but each receiver looks into a circuit of considerably higher impedance, formed by the line and the other receiver in series. So, while energy is transferred efficiently from the line to the receivers, any signal fed back from the receivers is greatly attenuated.

The *Mul-Tel* couplers may have two or four outputs, and where there is enough signal, a four-output unit may be fed to four other couplers rather than direct to receivers, making a 16-set distribution system.

A distribution system which will work where there is not enough signal for the types just described is often needed. A system that would pep the signal up a little to make up for the losses along transmission lines, rather than attenuate it, would be valuable in many installations. Ordinary TV boosters were first used to make up such a system. The simplest form appears in Fig. 3. Units marked IT-75A are home type boosters, the IT-77A's are commercial types. The isolating resistors prevent one TV set from radiating to another, and also cut down possibility of oscillation in the boosters themselves.

More than one television manufacturer modified his home type boosters for 24-hour operation, operating the tubes and parts at conservative ratings. Thus the IT (Industrial Television, Inc.) 77A's are commercial types, and 75A's home versions of the

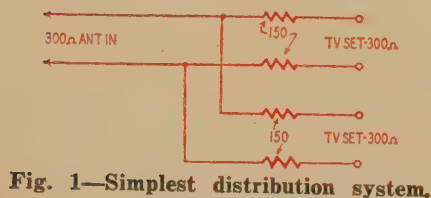


Fig. 1—Simplest distribution system.

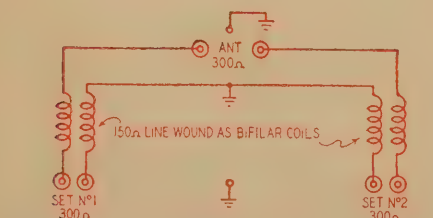


Fig. 2—An efficient two-set coupler.

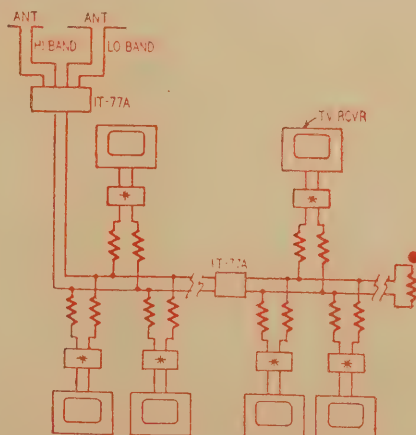
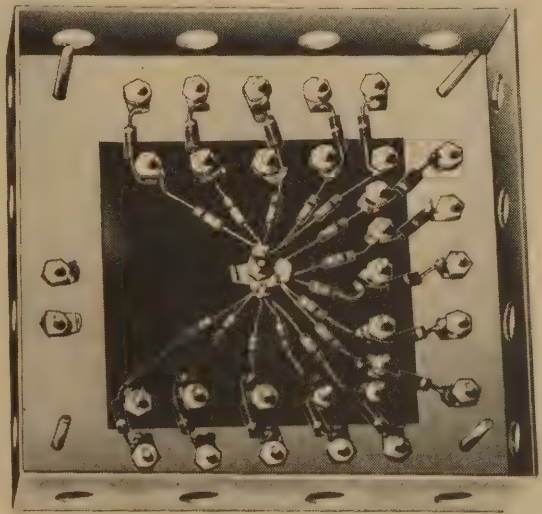
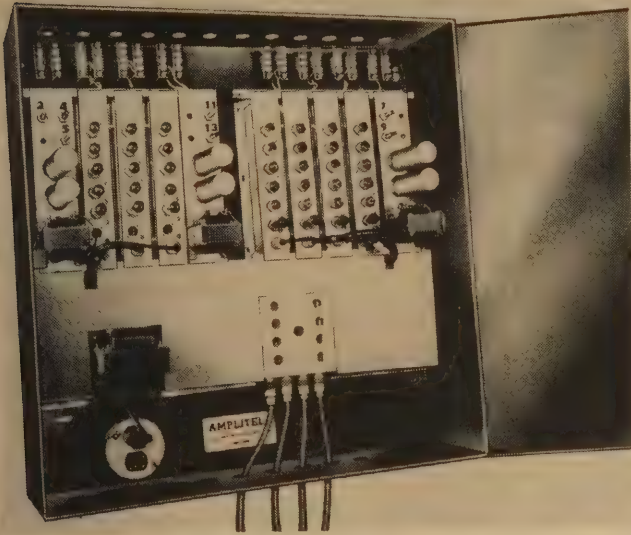


Fig. 3—A system made up of boosters.





Left—The *Amplitel* uses channel strips with several tubes each. Right—The junction boxes show ingenious design.

same booster; and some Blonder-Tongue boosters carry the same model number with the prefix CA for commercial and HA for home types. The next and obvious step was to put two outputs on a single booster.

The earliest two-output boosters were designed by coupling the coil in the r.f. amplifier's plate circuit to two output coils instead of one. More refined systems were developed to isolate the outputs from each other, and multiple-output *distribution amplifiers* were born. These may have two, four, or eight outlets in practical equipment. Amplification may be slight; in some cases there may be a slight loss through each unit. A typical system is that of Electro-Voice, using the model 3100 unit (See photo). This unit has four outputs for receivers and another line output to which a second distribution unit may be attached.

Where stations are weak, a booster may be added at the antenna, and where the signal is weakened in long runs of transmission line, an ordinary one-output *line booster* can bring it up to original (or greater) strength.

Another approach to the master antenna problem suggested itself—or rather was remembered, for it is an elaboration of the amplified master antenna system introduced by RCA in the 1920's. In this system there is a large central amplifier, with other amplifiers for receivers or groups of receivers if necessary. In its television form, the central amplifier is actually a number of single-channel amplifiers whose outputs are connected through a mixer and fed through coaxial lines to the various receivers.

The largest units of this type—made by RCA, Jerrold, G-E, and others—will be discussed in a separate article, on community antennas. A typical intermediate type is the *Amplitel*, made by Transvision for the company of that name. As shown, it consists of a number of channel units, or "strips." Each of these is a multitube amplifier, with the stages staggered to give full 6-mc

bandwidth. Separate antennas are used for each strip. Since each antenna receives from a single station, high-gain Yagis are generally used, and a strong signal can be put into the amplifier. In the *Amplitel* system, the low-channel strip amplifiers have five tubes and have a voltage gain of about 7,000. The higher v.h.f. channel amplifiers have six tubes, but the gain is not as great—about 4,000.

The signals from the various strips are mixed in an ingenious way. Each amplifier is connected to the mixer by a section of 72-ohm line a quarter-wavelength long at its channel frequency. A quarter-wave line acts as an impedance transformer. In this case its 72-ohm impedance ( $Z_m = \sqrt{Z_{in} \times Z_{out}}$ ) transforms the approximately 350-ohm output of the strip amplifier down to 15 ohms, the impedance of the mixing box, where  $Z_m$  is the impedance of the matching section,  $Z_{out}$  is the output impedance of the strip,

and  $Z_{in}$  is the mixer input impedance. Although the ends of the matching sections are simply paralleled, the impedance remains at 15 ohms. Each line is a matching transformer at its own frequency, but presents a much higher impedance at any other frequency. Thus there is very little interaction between the various sections.

Output of the matching section is a group of five 75-ohm cables, paralleled to have a total impedance of 15 ohms. Each of these goes to a distribution box which feeds 15 receivers. As can be seen from the photo, each of the branches consists of two resistors, 1,000 ohms in series with the hot antenna lead, and 100 ohms between that and ground. The 100-ohm input is effectively shunted by the 1,000-ohm resistor and cable capacitances, giving an impedance of about 70 ohms, which can be transformed up to 300 ohms with a matching transformer whenever necessary.

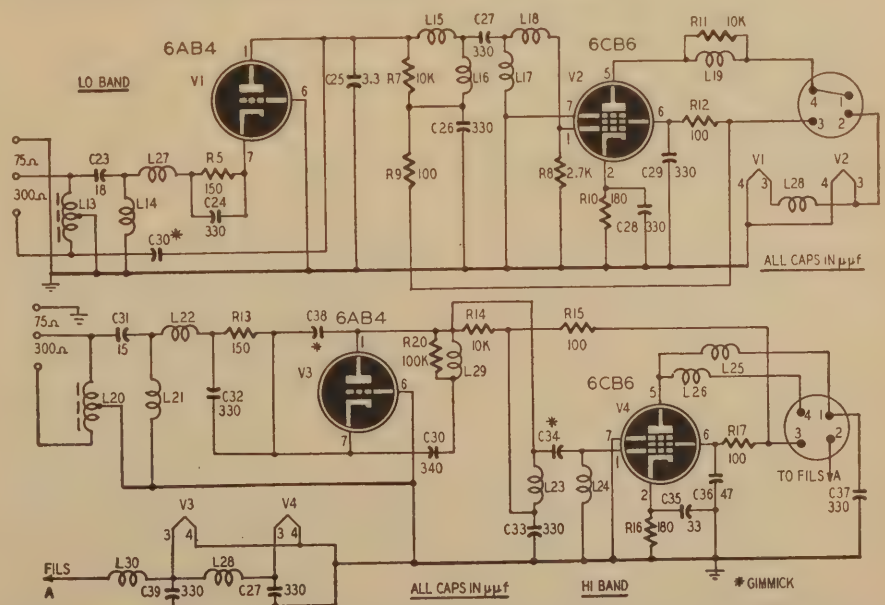


Fig. 4—High- and low-band strips of the Blonder-Tongue MA4-1. Constants vary slightly with frequency; these two are typical for channels 7-8. and 4.



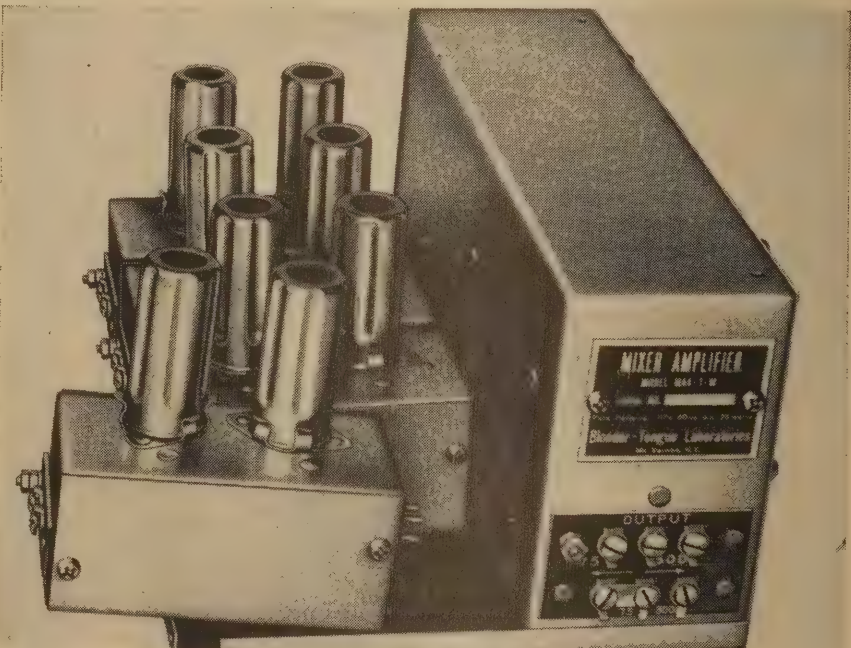
A link between the simple distribution systems (which are in effect wide-band boosters with some means of splitting the output and reducing interaction between sets), and the larger community type systems is the Blonder-Tongue mixer-amplifier system. The MA4-1 unit which is the heart of this system accommodates four plug-in strips plus one wide-band input which can be used for strong signals (any signals that can tolerate 10 db attenuation). The output is distributed through 2- or 8-receiver (DA2-1 or DA8-1) distribution amplifiers, which add a little gain of their own. If long runs have to be made, a commercial type booster (CA-1) can step the signal up 28 db over the whole spectrum.

A system of this type permits using sensitive Yagis for the weaker signals, while putting stronger ones through the system without amplification, thus economizing on amplifier strips in areas where there is one strong station and others are desired, or where there is a local FM station, but TV stations are remote. Each of the strips has a gain of between 16 and 18 db. Two tubes are used, a 6AB4 and a 6CB6. Circuit is slightly different for high and low bands, as indicated in Fig. 4. Two of the units can be used in tandem, for more than four channels.

Lowest-priced of all the multiple-antenna systems, the MA4-1 is economically practical even for single TV receivers in bad areas, and can be

used by stores, small apartments, groups of neighbors in fringe-area districts, and others who would find the simpler systems unsatisfactory and the large community systems expensive.

Some antenna systems resemble in their equipment the larger community types, though they may be intended chiefly for apartment-house application. A typical example is *Tacoplex*, which (though not normally sold as a community antenna system) includes a number of features not found in the simpler distribution systems. Fig. 5 shows a simplified diagram of a system using Taco units. Basic unit is a chassis-power supply, on which a number of strips and a mixer unit can be mounted. The mixer may or may not



Brach two-set coupler shown in Fig. 2.

Blonder-Tongue MA4-1 mixer-amplifier, described as usable “for 1 set or 2,000.”

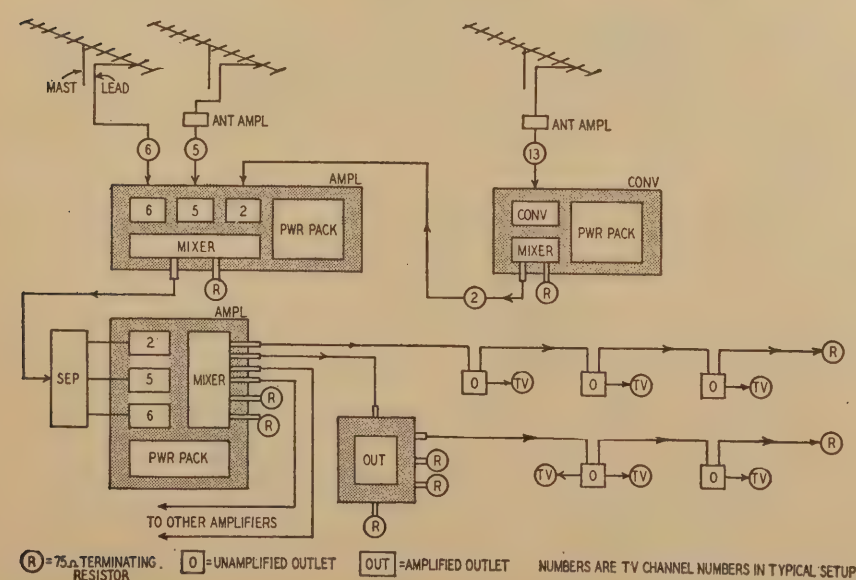


Fig. 5—Simplified drawing showing Taco components in a versatile system.

be electronic, depending on the signal level desired and the number of trunk lines to be fed.

An installation may have a number of other refinements. For example, a weak signal from a high-band v.h.f. station (channel 13 in the diagram) may be received on an antenna cut to its frequency, boosted by an antenna-top amplifier, then fed to a converter which changes its frequency to that of an unused low-band channel (channel 2). This reduces attenuation in long runs of coaxial cable.

Where there are long runs of cable between the original mixer and the receivers, the cable may be terminated in a signal separator, a unit with one input for the composite signal, and separate outputs for each frequency being handled by the system. These single-channel signals are again amplified through strip amplifiers, mixed, and sent on to the various outlet boxes, which may also be either electronic or nonelectronic.

END







# THE NEW UHF CHANNELS

Their channel limits, frequency of sound and picture carriers, and the equivalent wavelengths in inches.

(This material is abstracted from a table printed in "Application Data and Filing Information for Television Stations," a publication compiled by the Broadcast Engineering Section, Engineering Products Division, Radio Corporation of America, by whose courtesy it is here reproduced.)

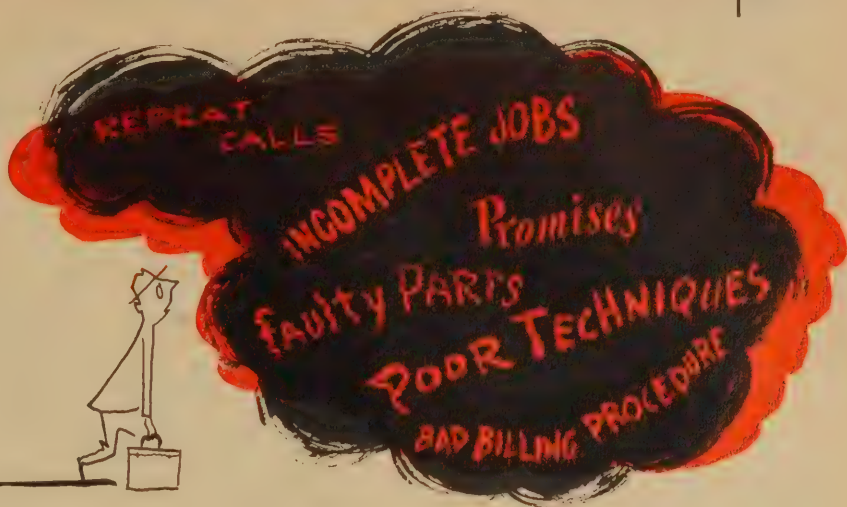
Chan- nel	Mc	Pix Carrier	Wave- lengths in inches	Sound Carrier	Wave- lengths in inches	Chan- nel	Mc	Pix Carrier	Wave- lengths in inches	Sound Carrier	Wave- lengths in inches
14	470-476	471.25	25.0455	475.75	24.8087	49	680-686	681.25	17.3251	685.75	17.2114
15	476-482	477.25	24.7307	481.75	24.4997	50	686-692	687.25	17.1738	691.75	17.0621
16	482-488	483.25	24.4236	487.75	24.1983	51	692-698	693.25	17.0252	697.75	16.9154
17	488-494	489.25	24.1241	493.75	23.9043	52	698-704	699.25	16.8791	703.75	16.7712
18	494-500	495.25	23.8318	499.75	23.6173	53	704-710	705.25	16.7355	709.75	16.6294
19	500-506	501.25	23.5466	505.75	23.3371	54	710-716	711.25	16.5943	715.75	16.4900
20	506-512	507.25	23.2681	511.75	23.0635	55	716-722	717.25	16.4555	721.75	16.3529
21	512-518	513.25	22.996	517.75	22.7962	56	722-728	723.25	16.3190	727.75	16.2181
22	518-524	519.25	22.7303	523.75	22.5350	57	728-734	729.25	16.1847	733.75	16.0855
23	524-530	525.25	22.4707	529.75	22.2798	58	734-740	735.25	16.0527	739.75	15.9550
24	530-536	531.25	22.2169	535.75	22.0303	59	740-746	741.25	15.9227	745.75	15.8266
25	536-542	537.25	21.9688	541.75	21.7863	60	746-752	747.25	15.7949	751.75	15.7003
26	542-548	543.25	21.7261	547.75	21.5476	61	752-758	753.25	15.6691	757.75	15.5760
27	548-554	549.25	21.4888	553.75	21.3142	62	758-764	759.25	15.5452	763.75	15.4536
28	554-560	555.25	21.2566	559.75	21.0857	63	764-770	765.25	15.4233	769.75	15.3332
29	560-566	561.25	21.0293	565.75	20.8621	64	770-776	771.25	15.3034	775.75	15.2146
30	566-572	567.25	20.8069	571.75	20.6432	65	776-782	777.25	15.1852	781.75	15.0978
31	572-578	573.25	20.5891	577.75	20.4288	66	782-788	783.25	15.0689	787.75	14.9829
32	578-584	579.25	20.3759	583.75	20.2188	67	788-794	789.25	14.9543	793.75	14.8696
33	584-590	585.25	20.1670	589.75	20.0131	68	794-800	795.25	14.8415	799.75	14.7580
34	590-596	591.25	19.9623	595.75	19.8115	69	800-806	801.25	14.7303	805.75	14.6481
35	596-602	597.25	19.7617	601.75	19.6140	70	806-812	807.25	14.6209	811.75	14.5399
36	602-608	603.25	19.5652	607.75	19.4204	71	812-818	813.25	14.5130	817.75	14.4332
37	608-614	609.25	19.3725	613.75	19.2305	72	818-824	819.25	14.4067	823.75	14.3280
38	614-620	615.25	19.1836	619.75	19.0443	73	824-830	825.25	14.3020	829.75	14.2244
39	620-626	621.25	18.9983	625.75	18.8617	74	830-836	831.25	14.1988	835.75	14.1223
40	626-632	627.25	18.8166	631.75	18.6826	75	836-842	837.25	14.0970	841.75	14.0217
41	632-638	633.25	18.6383	637.75	18.5068	76	842-848	843.25	13.9967	847.75	13.9224
42	638-644	639.25	18.4634	643.75	18.3343	77	848-854	849.25	12.8978	853.75	13.8246
43	644-650	645.25	18.2917	649.75	18.1650	78	854-860	855.25	13.8003	859.75	13.7281
44	650-656	651.25	18.1232	655.75	17.9988	79	860-866	861.25	13.7042	865.75	13.6329
45	656-662	657.25	17.9577	661.75	17.8350	80	866-872	867.25	13.6094	871.75	13.5391
46	662-668	663.25	17.7953	667.75	17.6754	81	872-878	873.25	13.5159	877.75	13.4466
47	668-674	669.25	17.6357	673.75	17.5180	82	878-884	879.25	13.4236	883.75	13.3553
48	674-680	675.25	17.4790	679.75	17.3633	83	884-890	885.25	13.3326	889.75	13.2652



# NEW TV AREAS

## what do they mean to the repair technician?

By JOHN F. RIDER\*



**M**ANY sections of the United States will receive television for the first time in the near future. Will the servicing personnel in these new areas make the same mistakes as those who have worked in TV areas for several years—or will they learn from the experiences of others? That's the big question.

The public has not been too happy with the TV technician. It is debatable where the fault lies. Experience has shown that certain acts of commission and omission by the TV service technician have irritated the public, and these operations have certainly been to the technicians' disadvantage. We are going to give a capsule review of a few of these malpractices in the hope that it will benefit service technicians in new TV areas, and those yet to be developed.

### The solemn promise

Failure to inspect a defective television receiver, or to return a repaired television receiver on the date promised, has irked the public very much. It has been, and still is a deplorably common practice. It can be explained in many ways, but no amount of apology satisfies a disappointed customer. The housewife who waits all day for the service technician who never shows up, is not interested in explanations. Especially if she had something important to do, and changed her plans to keep the appointment.

It may be unfair to place the entire burden on the servicing industry. Where extenuating circumstances prevent keeping a promised date the courtesy of a phone call requesting a change of appointment is imperative. Regardless of how busy you are, or how difficult it may have been to procure a certain replacement part—both common excuses for broken promises—the customer is always right. It's an axiom of good public relations, and there is no way around it. The TV service technician or small shop is hurt badly if labeled unreliable. It reflects on his competence, too.

In the TV servicing business word-of-mouth advertising by the public can do much good or harm. The smaller the community, the more important this is. Even in large metropolitan centers, experience has shown that good publicity over the canasta or bridge table can help a small service shop grow, or drive it out of business and make the large service facility even larger.

The small service-shop owner cannot wage an advertising or sales-promotion war with the large facility. He does not have the necessary funds; therefore, he must do everything that will make his customers speak in his favor. One of these is to keep the promise to call or to deliver. Since the service facility rather than the customer sets the time and day, it is a solemn responsibility on the part of the facility to see that it is kept. We know one TV set owner who was so angry because of a broken promise that he asked all of his friends in the neighborhood not to patronize the local service shop, in order to teach him a lesson.

### The repeat call

The repeat call is treated as a nuisance by many service organizations. It is handled as if the service shop were doing the set owner a favor. It's considered a profitless call, but whose fault was it in the first place? On second thought is it really profitless? Not only does it create good customer relations, but every service facility takes into account a certain number of repeat calls when it figures the costs on which it bases its service charges. (If it doesn't do this, it should.)

Making customers wait for you to correct an unsatisfactory repair is a sure way to make them angry. People let off steam by talking; panning the daylights out of a TV service facility always finds ready listeners and sympathetic ears.

Some service outfits wilfully ignore repeat calls. They know that it means the loss of a customer, but they feel that there are others. They forget that a dissatisfied customer—particularly one whose complaint is justified—can do more harm to an outfit's reputation

than the praise of a dozen satisfied customers can possibly overcome.

We're not going to be so foolish as to say that there should be no repeat calls to begin with. Sometimes they can't be helped, but we do say they can be reduced substantially. Every well-conducted and well-managed service facility considers repeat calls a reflection on the technician who did the work. In some organizations he is not paid for making the repeat call. If too many occur, he's out of a job.

The fact that repeat calls are not asked for is no sign that every repair job was done properly. As self-protection, TV service shops should determine the customer's reaction to the repair a week or more after the receiver is restored to service.

Giving the public the benefit of the fact that they do not understand the workings of a television receiver, rather than condemning them for it, will reduce the widespread demands for legislation and licensing. The customer will respect a firm stand when a charge is warranted and the case is properly presented—that is, without arrogance or insolence. But it is equally important to admit it when the shop is at fault—not necessarily by merely saying so, but by doing whatever is required to produce a properly functioning receiver. Servicing is a technical business, but it is not without its selling aspects. Politeness and understanding are essential.

### Using service data properly

Repeat calls are costly on several counts. Not only in the time involved, but also because they imply technical incompetence. This has been the loudest cry on the lips of the TV-receiver-owning public. It has to be anticipated in each new area, because fully trained and experienced personnel cannot be made available concurrent with the initial sale of TV receivers. But this is the industry's problem and not the public's. If receivers are sold, service should be available. If the servicing industry does not want competition from factory-service organizations, it must be ready for action when a new area opens up.

\*President, John F. Rider Publisher, Inc.



The set-buying public has the right to expect that the individuals who offer their services and facilities as TV service technicians have some sort of technical background. As a rule, these men are experienced radio service technicians. The main fault lies in the fact that many of them, in areas where TV is anticipated, wait until demand for TV service arrives before they make any move to acquire the necessary background. This has been the pattern time and again, and each time it has harmed not only the men themselves but the industry of which they are a part.

With radio servicing as a background, a knowledge of TV can be developed by reading—that is, if it is impossible to attend a school. Admittedly, a reading knowledge alone is of limited usefulness when work must be done—at least in the beginning—but it is better than no background at all. As time passes, more and more experience is gathered and the end-product improves. In the meantime a definite mental attitude for self-improvement must prevail. This has been lacking in many instances. Its consequences have been costly.

Every individual knows the extent of his capabilities. The more limited his experience, the more imperative it is for the TV service technician to use every device which will help compensate for this shortcoming. The most valuable of these are the service notes. There are many important reasons why TV-set-manufacturers' service manuals must be read and used. Not only for the schematics and circuit voltages, but for the circuit descriptions, installation and disassembly notes, manufacturers' production changes, and the trouble-shooting charts. Cures for troubles which may have appeared in a particular receiver, and which the set manufacturer has incorporated in subsequent production runs of that model, are also contained in these notes.

The less experienced the individual, the more vital this information is. It is paradoxical, but the more-experienced TV service technician makes greater use of the set-manufacturer's service manuals than the inexperienced man. The reverse should be true. Trial-and-error methods of servicing are costly to the beginner and to the public. The inexperienced technician spends hours doing what might be done in a fraction of the time.

How much repair time can a technician afford to spend on a TV receiver, and how much repair time can he charge for? How high can the labor charge be without arousing the ire of the public? How can the public be pacified when the so-called repaired receiver is not functioning properly? . . . The answers to these questions lie in the full and proper use of the set-manufacturer's service manuals, in taking full advantage of the guidance which they offer, and in following the instructions which they contain. In addition, the proper use of service in-

formation increases your technical background. It compensates for limited experience or lack of school training.

### The uncompleted repair job

When the public raises the cry of incompetence against the TV service technician, they group many things under one name. They hang the same label on the man who is careless as on the man who doesn't know. For example, tube failures are common faults in TV receivers. Simple tube replacements frequently correct a fault, but many times it is only a temporary repair. While time is of the essence in repair operations, the need for speed (and minimum cost) does not warrant a total disregard of other operations which may be necessary when a tube has to be replaced.

Tube failure may occur because of a defect in the circuit—the kind of a defect which eventually wears out the tube, but does not become evident immediately when a new tube is put into the socket. Perhaps thoughtlessness or carelessness on the part of the service technician accounts for his failure to make the necessary circuit tests. Or it may be that the service shop sets a time schedule for the field man which prohibits such tests. It is not uncommon for set manufacturers to recom-



mend a circuit change in order to prevent frequent tube failures at one position in the receiver. The last item gets us back to the service manual again. Putting a new tube in this position will restore operation, but unless the circuit change also is made, the new tube will fail in a relatively short time.

Many tube replacements involve frequency-sensitive circuits. Not all brands of tubes may function equally well in a particular circuit nor does the first few minutes of operation of a new tube in a circuit indicate the performance an hour later.

In frequency-sensitive circuits, mere tube replacement may not always be the complete answer. The circuit may call for readjustment in order that the receiver perform *correctly*, not just "good enough." A complete readjustment may not be required, but the need for it should be checked. This increases the time spent on the job, and must be recognized in any field-service program which a service shop puts into effect. The lack of it accounts for some of the complaints that "After the service technician was here, the receiver did not function as well as before."

In any case operators in new TV areas should do everything they can to avoid such occurrences.

### Replacement parts

Some service shops (not many, for-

tunately) have committed the unforgivable sin of using surplus parts as replacements in TV receiver repairs. This is too big a risk to take without knowing the history of the part, its age, or its electrical condition. The public and the set manufacturer have the right to expect better treatment. Using a part of this kind even occasionally, because it may not be convenient to get the exact replacement part, is no excuse. It just is not fit for this type of duty! It may work perfectly at first, but even this is no justification, because such a part cannot be guaranteed. If a service technician attaches any sort of a guarantee to a surplus part used for replacement purposes he should have his head examined.

We must stress one more point on the subject of replacement parts. This is the use of a compromise part as a replacement. By compromise we mean one that is not the exact equivalent of the part being replaced. This does not imply that every replacement part must be an exact duplicate. It is not always practical to procure exact duplicates and still satisfy the time requirements on repairs. But it should be standard practice to make certain that the replacement part you use fits the needs of the receiver to which it is applied; and that it does this without requiring major alterations on the chassis to accommodate the replacement part. The customer should not have to be charged for time spent in this manner.

Many replacement parts available on the open market from parts jobbers satisfy the physical and electrical performance requirements of the receiver. If they do not, get exact duplicates from the set manufacturers' distributor even if it means waiting for delivery. For its own protection, the servicing industry must pay closer attention to the replacement-parts situation. There is no such thing as "good enough" in this case. The public has every right to expect you to use the proper parts, and that they will perform perfectly.

Another point of deep concern to all service technicians and service shops—especially those just beginning their activities in new TV areas—is the charge for replacement parts. Although there is no apparent reason why the TV servicing business should be seasonal, it has its ups and downs. It has its seasons of great activity and slow periods.

Active periods must provide operating funds for the bad times. This cannot be done unless service charges are high enough to return a profit, and the parts used in repairs are sold to the set owner at list price, so that the full margin of profit is realized. This is an absolute must. Service facilities can juggle the labor costs if they wish, in accordance with the level of efficiency developed in the shop, but the full profit must be made on the parts.

Some TV service technicians base their selection of replacement parts on



price alone. This is wrong. Price must be considered secondary to performance. The replacement part is paid for by the customer, and the technician should not lose sight of the difference in profit when the higher-priced item is sold. *You are not taking advantage of the public if price reflects quality.* Always bear in mind, whether buying or selling, that the best is the cheapest in the long run. If this approach requires greater selling pressure on the part of the service facility, then use it.

### Improved techniques

Let's consider a few items that relate to servicing or trouble-shooting techniques. We say that these are native to old TV areas only because that is where TV now exists. The suggestion to improve techniques in TV areas yet to be opened fits the old areas too, because we think that many represent improvements that many old TV areas have yet to put into effect.

First there is the matter of capacitor testing. Leaky capacitors are a major item in TV receiver troubles. The standard procedure has been to check for low insulation resistance with an ohmmeter. This is *not* an adequate test. It can be misleading because the test conditions do not conform with the conditions of use.

The test voltage available in an ohmmeter is about 1 to 3 volts. In a few cases it may run as high as 30 volts. Even this highest voltage is not sufficient to show up capacitor leakage on an ohmmeter test, unless the insulation resistance has fallen to a very low level. The result is that many ohmmeter tests indicate a good capacitor, but when the part is reinstalled in the receiver its operation is faulty because its insulation resistance may have fallen below the value permitted by the circuit voltage.

The answer is to test for capacitor leakage by applying the same voltage as in the receiver, using a voltmeter and milliammeter as the indicators. With this test the findings are conclusive, and much time is saved.

Another prominent trouble-shooting weakness which has demonstrated itself in old TV areas is in placing too much dependence on d.c.-resistance values of certain components—especially coils and transformers. This is especially true when low values of resistance are involved. The problems associated with the measurement of very low ohmic values—crowded meter scales, contact resistance, and tolerance in the parts—have caused many substitutions which were never necessary.

D.c.-resistance ratings of windings are average values, and can vary by 10% or more in many instances and not indicate a fault. On the other hand, when the correct values are less than 1 ohm, a defect may not show up on a resistance test because an imperfect contact at a clip connection can add enough circuit resistance to offset the result of the fault.

An alternative, which will find increased application as suitable test equipment becomes available, is to measure an a.c. characteristic of the part. Many of the specifications for inductor type components are in a.c. values. In the meantime, determine the condition of the component by measurement under signal conditions with a scope and vacuum-tube voltmeter. Unfortunately, these pieces of equipment do not see as much use as they should. Properly used, they save much time because they lead to positive conclusions. This, in turn, saves much more time that would ordinarily be wasted in removing and substituting components unnecessarily.

Another item which should interest service technicians in new TV areas is the limited utility of tube checkers as guides to the condition of tubes used in TV receivers. This comment does not deny the general utility of a tube checker; it is still an important item, but no test equals the simple substitution.

Many tubes will show O.K. on a tube checker, yet will not perform well in a *multivibrator* stage of the television receiver. The same tube will more than likely work perfectly in some other socket.



Another interesting item is the measurement of grid waveforms and peak-to-peak voltages in stages which depend on the drive for the bias.

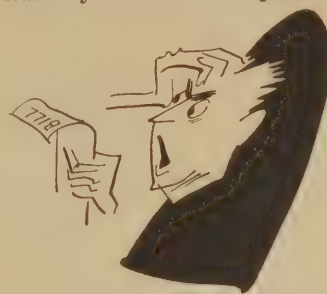
As far as test equipment is concerned, the greatest weakness has been the failure to use the scope for these measurements. Although a great many scopes have been sold to the servicing industry, they are not used as much as they should be. The scope has tremendous capabilities, and anyone who is active in television servicing, yet who is not familiar with scope applications, is not taking advantage of the greatest time-saving device available.

It must be admitted that the trace on the scope screen requires interpretation, but unlimited reference information is available for guidance in service manuals. A cardinal requirement for TV service technicians is to gather data from experience—that is, to associate changes in waveforms with certain types of defects. This is not too difficult. Even if it requires spending some time in supplementary study, it is more than worth while, because it leads to faster, more economical servicing.

### The bill for service

The usual form of invoice for service submitted to the set owner by a TV service shop can be improved to make the life of the shop owner much easier. Making out a simple bill which lumps all the services into one sum and then shows the total price of the

parts replaced as another sum, places the shop at a disadvantage. This is especially true where there is a substantial charge for labor and time, and a relatively small bill for parts.



The ratio between these two amounts is generally high—anywhere from 10 to perhaps 20 to 1 in favor of labor and time. The public just does not understand that the time and labor charge may not be any greater for replacing a \$20 part than for a part that cost only \$1. They cannot be expected to understand because no one has taken the trouble to tell them.

Recognizing the difficulty of educating the public, the best thing is to use the service bill for educational purposes. Make the bill show everything involved in completing the repair. Itemize the different operations separately—travel time, removing the chassis from the cabinet (if necessary), inspection, pickup and delivery, etc. Virtually every service job involves at least six or eight operations of this type. Show them all. Then list the charges for the parts replaced.

Making out bills in this fashion is the psychological approach. A \$10 time and labor charge doesn't look so bad with respect to a \$1 part, when handled in this fashion. It is a perfectly honest presentation. The additional time spent making out an invoice of this kind will save much explaining.

The points we have raised in this article are known to every person who has sold his services to the TV-set-owning public. Service facilities may have viewed some of them as relatively unimportant. This is completely wrong. Drops of water falling on a stone will eventually wear it away. Small things have irritated the TV set owner time and again. Patience will wear out in time.

The service technician views his activity as a profession. That is fine as far as it relates to ethics and pride in his work. But it is still a business, and the fundamentals of operation which are axiomatic in sound business must be practiced.

A number of actions of TV service facilities over the years have bothered the public. Men opening shops in new TV areas should learn from these. Public complaints have not always been just, but many of them are well-founded. They are not beyond correction; it does not make good sense for new shops to follow in the footsteps of some of the old ones and repeat their failings. Every one should learn from—and profit by—the experiences of others!

END



NTSC

COLOR

TV

This newest system combines the best features of several methods of color television

By EDWARD SIEMINSKI\*

**A** YEAR or so ago anyone who expressed a preference for a particular color-TV system<sup>1</sup> was likely to find himself in the center of a heated argument. Now, at last, time and technical progress are clearing the air, and a new system—NTSC—has emerged out of the confusion.

Named after its sponsor, the National Television System Committee, the new system is the joint development of a broad cross-section of the radio-television industry.

### NTSC background

NTSC was created in 1940 by the Radio-Television Manufacturers Association (then called the RMA) to assist the FCC in developing and formulating a set of standards for black-and-white television. These standards are now the basis of our present TV system.

The committee was reactivated in the late 40's when the FCC was holding hearings to establish standards for U.S. color television. Its new purpose was to gather background information on the general problem.

In 1950 the famous "Ad Hoc" (single-purpose) Committee was set up under Dr. W. R. G. Baker for a concentrated study of the state of the art. It examined the work of several laboratories working on various systems of color transmission with the idea of deciding if one or more of their methods offered promise as a *compatible* color system. On the basis of the *ad hoc* report, the RTMA reorganized NTSC into nine panels made up of prominent engineers. In the spring of 1951 these panels launched an intensive and extensive program of organizing, selecting, and testing the best features of all color television systems. The panels will set

up system standards based on the results of these tests, and NTSC is expected to embody these in a formal proposal to the FCC in the near future. The work being done by NTSC has become an outstanding example of engineering co-operation and achievement.

Before going into the wondrous complexity of NTSC transmission let us first review the current status of color TV in the United States.

### Field-sequential color TV

The present U.S. standard system—the only one permitted for commercial color-TV transmissions—is the *non-compatible* field-sequential system sponsored by CBS<sup>2</sup>. A program transmitted by this method cannot be displayed either in monochrome or in color on a standard television receiver without extensive circuit modifications (especially in the horizontal and vertical sweep sections). There is practically no audience for these color programs. This lack of a large audience discourages sponsors. Lack of sponsors discourages station construction. Without stations, there will be no audience, and without a prospective audience there will be no receiver production. As yet, no way has been found to break this vicious circle.

Engineeringwise the field-sequential system suffers fundamental handicaps. Briefly, it transmits *three* complete pictures in sequence: representing first the red, then the green, then the blue light picked up by the camera televising a color scene. However, the 6-mc bandwidth of a regular television channel is just enough to carry only *one* such picture in full detail. The necessity for trimming all three color signals to crowd them into this meager channel space results in degraded picture detail, objectionable flicker, and color instability with fast motion.

The field-sequential method *does* have

excellent color rendition and very desirable simplicity. Belaboring it here for its weaknesses is done only to indicate the room for improvement.

### NTSC Color TV

NTSC transmission was born in the same ideas that inspired RCA's *dot-sequential system*, but the NTSC system is not sequential. It is a *simultaneous* system, since the three primary colors in the picture are encoded electrically, not one after the other, but *all three continuously*. Many independent laboratories have contributed to its development.

It is a high-efficiency system, in which the equivalent of a 12-megacycle-wide picture (4 mc for each color) is transmitted within a 6-megacycle-wide channel<sup>3</sup>, the same bandwidth used for conventional television.

In a nutshell, the new system transmits an ordinary black-and-white television picture, to which is *added* a modulated subcarrier signal conveying information about the coloring in the picture. From that viewpoint it could be called "colored" television. Although a color receiver is needed to display the *colored* picture, the system is compatible; that is, it will reproduce the picture on an ordinary television set in black-and-white (monochrome) without altering the set in any way.

Most of us have been taught that for a circuit to carry more information in a unit time the bandwidth of the circuit must be increased (provided the information is sent strictly in its original form, as in standard AM broadcasting).

How does the NTSC overcome this rule? Theoretical analysis provides the answer. It shows that any conventional television scene, when translated into a video signal occupying a given channel, does not fill that channel space completely. In fact, there is a regular

\*Sylvania Electric Products Inc., Bayside, New York.







ages which have exactly the same frequency but are 90° out of phase. The combined result, the *chrominance* signal, becomes a two-phase subcarrier, with each phase amplitude-modulated by picture-coloring information.

Our video signal is now complete, the *luminance* and *chrominance* signals providing all the information needed to reconstruct the color scene. A station transmitter handles it substantially as it would any normal black-and-white picture. Fig. 3 shows the makeup of the transmitted frequency spectrum.

The synchronizing signal is the same as the one used for monochrome television, except that a color-sync signal is inserted on the "back porch" of each horizontal sync pulse (Fig. 4). In the receiver this burst synchronizes the local "color oscillator" which is used to demodulate the color signals.

### The receiver

At the receiver, Fig. 5, all circuitry up to the output of the picture detector is conventional.

Let us start with the band-pass filter. This rejects all frequency components of the signal except the region containing the *chrominance* signal (see Fig. 3). The output of the band-pass filter feeds separate red and blue *chrominance* demodulators. The color-difference signals R-Y and B-Y are extracted by reversing the process of sub-carrier modulation at the transmitter. The local *color oscillator* supplies two sine-wave signals having exactly the same frequency and phase as the sub-carrier which was used for encoding at the transmitter. (These oscillators are synchronized with the color subcarrier by the bursts mentioned above.) The demodulation is a zero-beat form of heterodyning sometimes called "synchronous detection".

In the *matrix-circuit* block the R-Y and B-Y signals are mixed in predetermined polarities and proportions to produce the G-Y signal.

Finally, the three decoded *color-difference* signals are combined with the main *luminance* signal to reproduce the G, R, and B color signals which originally left the camera of Fig. 1. For example, adding R-Y to Y leaves R alone. The R, G, and B voltages are applied separately to the tricolor picture tube to re-create the scene.

### Color reproduction

The great advantage of the NTSC system lies in its economical handling of color information. In Fig. 1 we noted that the R, G, and B signals were each limited to a bandwidth of about 1 mc implying the transmission of a limited amount of coloring information. The luminance information (picture detail) occupies the full 4-mc bandwidth.

This bandwidth relation makes sense when you understand how the eye sees.

Visible light produces three separate and distinct sensations: *brightness* (relative intensity or luminance), *hue* (recognition of red, orange, yellow, etc.) and *purity* or *saturation* (the degree to which the color is off-white, ranging from zero saturation, or white, to 100% saturation, meaning a deep, vivid color, a pure hue). The human eye is extremely sensitive to brightness variations but surprisingly insensitive to changes in hue. The NTSC transmits picture information only to the extent that the human eye is capable of appreciating it.

One more puzzling question, *color mixing*, deserves attention. The tricolor picture tube operates on the principle of *additive* color mixtures. A good example of this is a cluster of partially overlapping colored lights, as in Fig. 6. The overlapped areas show some examples of *additive* mixing. Mixing colored paints, or looking through superimposed color filters are examples of *subtractive* color mixing.

The phenomenon of color sensation is in direct contrast to the sense of hearing. Most of us can identify the instruments being played from the general character of the sound, and a trained musician can even recognize the individual notes which make up complex musical tones. The eye has no corresponding ability to recognize the individual components of a color mixture. The eye perceives only the *overall result* of the mixing. With the proper set of primary colors, such as the red, green, and blue used in NTSC, we are able to reproduce practically the entire range of colors.

A word about the color picture tube, without which the NTSC system would be almost entirely useless. The shadow-mask type three-gun tricolor tube<sup>4</sup> has received much attention. Rapid progress has been made toward one or more color-tube designs suitable for mass production at reasonable prices.

Receivers for the tricolor tube are being developed by several companies. The big problem is to simplify the circuitry.

Test transmissions with the NTSC system have been made in New York, Chicago, Philadelphia, and Syracuse. Assuming that transmission standards are successfully formulated and the FCC adopts the system, it would probably take at least two years before the NTSC system could become a commercial reality.

END

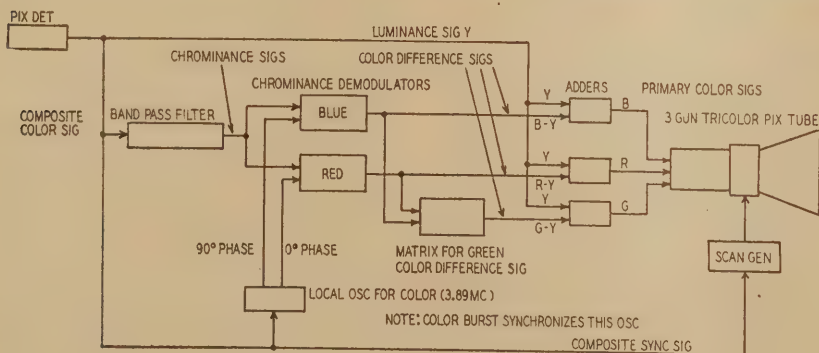
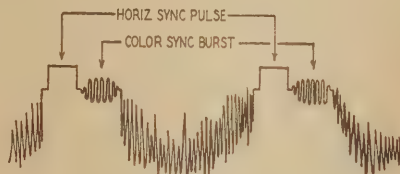
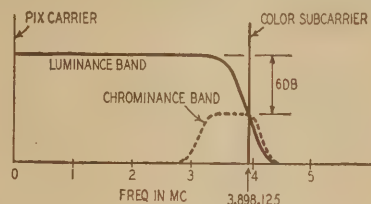
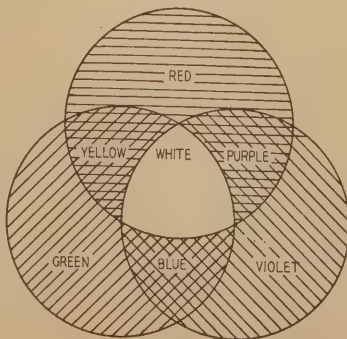


Fig. 3, top—Relative positions of the picture carrier and the color subcarrier in the upper sideband of transmitted signal. The vestigial lower sideband and the sound carrier have been omitted. Fig. 4, next to top—Color-sync bursts consisting of nine cycles of the 3.898125-mc color subcarrier are sent on the unused "back porch" of each regular horizontal sync pulse. Fig. 5, above—Block diagram of the receiver color circuits. All sections of the receiver ahead of the color unit are conventional. Fig. 6, right—Color combinations produced by blending colored lights (additive mixing).



### References

- <sup>1</sup>Color Television Systems. Fred Shunaman, RADIO-ELECTRONICS, January, 1951, page 20.
- <sup>2</sup>Color Television—U.S.A. Standard. P. C. Goldmark, J. W. Christensen, and J. J. Reeves, Proceedings of the I.R.E., October, 1951, page 1288.
- <sup>3</sup>An Analysis of Color Television System. A. V. Loughren and C. J. Hirsch, Electronics, February, 1951, page 92.
- <sup>4</sup>A New Picture Tube for Color TV. RADIO-ELECTRONICS, June, 1950, page 27.



Propagation  
students  
and dx hounds  
had an  
interesting

# TV DX in 1952

year By E. P. TILTON, WIHDQ

EXPERIENCED TV dx observers and amateurs who watch the 50-mc band for signs of dx all agree that 1952 was definitely subnormal in incidence of sporadic-E skip. For readers who may be just getting into this business of TV dx, sporadic-E skip is the means by which TV signals are bounced back to earth from the ionospheric E-layer, some 50 miles above the earth's surface, providing reception at distances ranging from 400 to 1,200 miles and more.

Ionospheric dx wasn't supposed to happen in the v.h.f. region, and the truth is that it occurs only a very small percentage of the time, but when it does develop it causes low-band TV signals to do amazing things. The reflection qualities of the sporadically ionized patches of the E layer become well-nigh perfect at times, with the result that signals from hundreds of miles away may come in with unbelievable strength, knocking out or seriously interfering with local stations.

Many observers, both in television

and amateur radio, have tried their hands at predicting the occurrence of sporadic-E skip in advance. They have met with a measure of success, and more is being learned about this amazing phenomenon all the time, but it is still very much a horse race. Perhaps that's just as well, for if we were able to turn on our TV sets or our 50-mc ham rigs at an appointed time to receive dx signals or work 50-mc stations halfway across the country on schedule, both pursuits would soon lose their appeal.

Meanwhile, we have a fascinating hobby, and one that is being put to good use. By careful observation and recording, v.h.f. amateurs and TV dxers have made available great masses of data for scientific study. During 1952 the people listed at the end of this article have contributed several hundred individual observations of TV dx, summaries of which appear in-graph form herewith. A number of interesting facts are apparent from a study of these graphs.

A plot of the observations by months appears in Fig. 1. The upper portion shows the number of days that dx was observed; the lower shows the number of reports each month. Look back at a similar presentation<sup>1</sup> for 1951 and see how symmetrically these graphs rise and fall, showing the now well-established rhythm of the sporadic-E dx seasons. The major period is the months of May, June, and July, but another well-defined peak develops around Christmas time. Both periods are spread equally either side of the longest and shortest days of the year. Despite this cyclic effect, dx never quite runs out; there is rarely a month when no dx at all is reported by the sharper observers.

The effect of frequency shows clearly in Fig. 2. Breaking the observations down by channels, we see that the lowest, channel 2, accounted for 38% of the reports, with only 14% of the sta-

<sup>1</sup> TV DX in 1951—RADIO-ELECTRONICS, January, 1952, page 40.

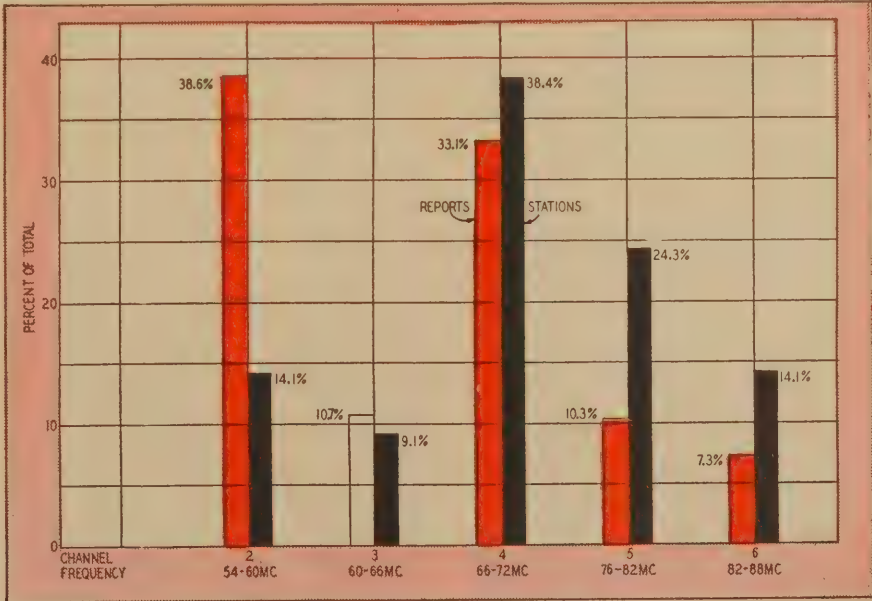
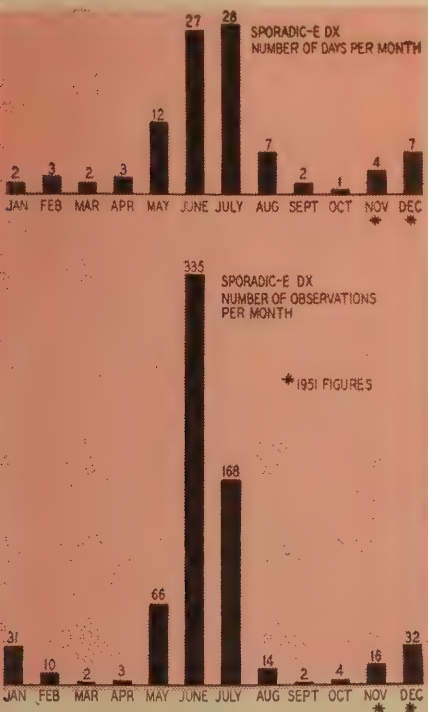


Fig. 1, left—A year of sporadic-E dx by months. The November and December figures are for 1951. Fig. 2, right—Dx reports by channels compared to the number of stations per channel. Black lines are stations, colored ones reports.



tions in North America. Percentages of reports and stations are just about equal for channel 3. The most heavily populated channel, 4, with 38% of the stations brought in only 33% of the reports. Channels 5 and 6 together having the same number of stations as channel 4, accounted for only 18% of the reports between them. There were no reports of high-band dx that could be positively identified with ionospheric effects.

Geographical location of the transmitting station is an important factor. Stations in the South and Middle West monopolize the top spots in the tabulation of reports by stations. As in 1951, KPRC, Houston, Texas, leads the pack by a 3-to-1 margin. The four Cuban stations, though their dx field is confined to little more than a 90-degree segment, are mentioned in 12% of the reports. Nearly half of the TV stations now using the low channels are above Latitude 40, but they accounted for less than 33% of the dx reported.

### Some outstanding reports

TV dx observations come from some surprising places, some of them localities where there is no regular TV service. Observer Canning, Halifax, Nova Scotia, is 400 miles from the nearest TV station, yet his log includes 44 stations in 36 cities. He is the holder of the Western Hemisphere dx record, having logged PRF-3, Sao Paulo, Brazil, in the summer of 1951.

A growing group of dx-ers in the Halifax area keep in touch with each other by telephone. During the height of an aurora borealis display on September 29, several of them noted that the signal of WJAR, Providence, R.I., channel 11, was strong on both sound and video, but the two could not be received simultaneously. This condition had been noted previously when selective boosters were used, but this time removal of the boosters made only a slight improvement. If this was the result of auroral conditions it is the first time that aurora effects have been noted above 200 mc.

Strong but fading signals were received on channels 3 and 5 the same evening. On September 5, a coastal inversion brought in signals from WBZ, Boston, 4; WNBZ, New York, 4; WABD, New York, 5; WFIL, Philadelphia, 6; and WJAR, 11. Audio only was heard from WCBS, New York, 2, bearing out the observation that tropospheric effects increase with frequency.

Several multiple-hop dx observations (in excess of 1,500 miles or so) were reported during the summer peak. Leader in this department was Observer Royal, of Red Bay, Ala. Bob caught KRON, San Francisco, 4; KING, Seattle, 5; KSL, Salt Lake City, 5; KOB, Albuquerque, 4; KPHO, Phoenix, 5; and KTLA, Los Angeles, 5, in a single evening. In a 24-hour period, June 13-14, Royal identified 26 dx stations. Another Florida observer, Simkin, of Orlando, reports 48 stations

logged there, and another 11 picked up from a location in Arlington, Cal.

Florida Observers Hall of Miami and Sloan of Braden Castle, report fine tropospheric reception of the Cuban stations. Hall gets them more or less satisfactorily the year around, and Sloan pulls them through beginning in May. He also sees the Jacksonville station, WMBR, 4, most of the time over a 200-mile hop.

To the average home viewer who looks at one or two stations for his TV entertainment, the totals of stations logged by the more avid dx enthusiasts seem almost incredible. Observer Lowther, Alexandria, Ind., lists 55 stations identified over a 3½-year period, including such choice high-band tropospheric dx as WJAC, Johnstown, Pa., 13, 350 miles, WNBZ, Binghamton, N. Y., 12, 520 miles; and WJZ, 7, WOR, 9, and WPIX, 11, all of New York City, more than 600 miles!

In three weeks ending June 15, Observer Merkel of Detroit logged 31 stations, 14 of them in the high band. Observer Dull, Washington, D. C., had 31 calls on his list. Then he took his equipment on a vacation in southwestern Pennsylvania in July and August, running up a total of 49 stations in two months. Patrick of Abilene, Texas, has 40 stations in 18 states, Cuba, and Mexico. DeGroat, Salamanca, N. Y., has 26 low-band dx stations. Whitfield, Altoona, Pa., identified dx on 25 days between April 29 and August 13.

One of our northernmost observers, A. E. Wilson of Port Arthur, Ontario, logged a total of 25 low-band stations, all sporadic-E dx with the possible exception of Chicago and the Twin Cities, which might be just in the tropospheric range under the best conditions. His most consistent dx reception was WSB, Atlanta, Ga., 2, with KPRC, Houston, Tex., 2, came second. Practically all of Wilson's dx came from the area represented by the amateur W4 and W5 call areas, as does a large part of the 50-mc dx worked by our friends north of the border. Only toward the end of July was any eastern dx recorded.

Wilson noted interesting coincidence with weather conditions as indicated on weather maps telecast by several stations he received. On consecutive openings in June, weather maps showed pronounced cold fronts at right angles to the transmission path, just about midway between transmitting and receiving locations. On July 7, when WFMY, Greensboro, N. C., 2, was in solidly from 10:30 pm to midnight, a cold front extended along the line to the transmitting location. On July 27, when a cold front swung around to the midpoint of the path, New York, Boston, Philadelphia, and Washington appeared. Both amateur and TV dx-ers have noticed that sporadic-E skip is predominantly across areas of low barometric pressure; almost never in or across pronounced highs.

Unquestionably the most prodigious job of observation and reporting in 1952 was turned in by Louis M. Matullo, of Washington, Pa. He is able to do a phenomenal job of logging dx on both high and low channels from his 2,956-foot elevation in Southwestern Pennsylvania. Under normal conditions Mike receives 20 or more stations over a radius of nearly 300 miles, around three-fourths of his horizon. He has kept a daily record of stations received for more than a year. They include 53 calls, 37 of which have been received without the aid of sporadic-E skip. At least 18 different high-band stations have been logged, including WENR, 7, and WGN, 9, both of Chicago, nearly 500 miles away.

### New receivers a factor

Much more high-band dx was reported in 1952 than in previous years, largely as a result of the improved high-band performance of the newer receivers. Increased awareness of the possibility of high-band dx was also a contributing factor. Observer Gehrein, Erie, Pa., reports frequent reception of WSPD, Toledo, 13, 185 miles, and WXYZ, Detroit, 7, 165 miles. Runnells and Holmes of Ottumwa, Iowa, report WENR and WGN, 250 miles. McGough of Milwaukee staggers us with KLAC, Los Angeles, 13, on June 12. We'd like to know more about this one, as it exceeds by several hundred miles the best amateur or TV dx ever reported on frequencies above 100 mc. It can happen, though—200-mc radar sets have picked up targets 1,700 miles distant!

The period September 7-10 provided an unprecedented opportunity for high-band dx of a tropospheric nature. During that time amateurs using the 144, 220, and 420-mc bands worked dx beyond their wildest dreams.<sup>2</sup> The 9th was the biggest date, Matullo logging 37 stations at Washington, Pa., between 4:30 pm and 1:55 am the following morning! These included just about every high-band station to the south, west and northwest, within a radius of 500 miles. Landek, W9WOK, Bensenville, Ill., took time out from a big night of 144-mc amateur dx to log 24 stations on 11 channels in 10 states: Illinois, Indiana, Wisconsin, Michigan, Ohio, Iowa, Missouri, Minnesota, Pennsylvania, and Tennessee. The best dx was WICU, Erie, Pa., 12, 450 miles.

This all came about as a stable high-pressure center moved slowly across the Great Lakes and over to the Atlantic Seaboard, a stable air-mass boundary forming along its trailing edge.

TV dx was not without its humorous sidelights. One unintentional joker was a publicity blurb writer for one of the leading TV manufacturers. In a release sent to magazine editors he credited a Colorado owner of one of his client's new consoles with the "world's record for long-distance television reception."

<sup>2</sup> For a compilation of v.h.f. dx worked during this period, see November, 1952, *QST*, page 45.



The viewer in question had reported picking up stations as much as 1,200 miles away! The staff at RADIO-ELECTRONICS concludes that there is at least one person who doesn't read our TV dx reports!

And Observer Samuels, Mount Vernon, N. Y., says that the way of the TV dx-er is hard. Most people just don't appreciate it. When Dan called in his next-door neighbor to show off his reception of a Washington, D.C., station, over 200 miles to the south, the only comment was, "Lot of snow on it, isn't there?"

#### LIST OF OBSERVERS, 1952

Aliaga, Frank, El Paso, Tex.  
Ambrose, G. W., Randallstown, Md.  
Amery, Gordon, Braymer, Mo.  
Ashcraft, Calvin E., Coolidge, Ariz.  
Baldwin, G. H., Hamilton, Ont.  
Bashta, William, Los Alamos, N. Mex.  
Bedrosian, Peter, Newburyport, Mass.  
Bente, Waldemar, Dennison, Ohio.  
Billings, R. A., Shiro, Tex.  
Canning, L. A., Halifax, N. S.  
Cantwell, William, Denver, Col.  
Carnes, P. C., Orangeburg, S. C.  
Collier, J. W., Arlington, Va.  
Conover, R., Stone Ridge, N. Y.  
Croy, John E., Dayton, Ohio  
DeGroat, F. E., Salamanca, N. Y.  
Dochak, Mike, Sudbury, Ont.  
DeGeer, M. W., Tulsa, Okla.  
Dempster, M. K., Tyndall, S. Dak.  
Dull, R. E., Washington, D.C.  
Edens, L., San Antonio, Tex.  
Elberburg, Columbus, Miss.  
Evans, L. M., Gaylord, Mich.  
Ferguson, G. A., San Antonio, Tex.  
Foyer, Joe, Westville, Ill.  
Gandol, Jose; Preston Orierte, Cuba.  
Garcia, Albor Otero, Varadero Beach, Cuba.  
Gehrlein, James, Erie, Pa.  
Glenn, Quentin D., Carlisle, Pa.  
Golden, S. J., Oak Bluffs, Mass.  
Green, Vernon F., Saratoga, N. Y.  
Green, M. F., Casper, Wyo.  
Groves, A. L., Brooke, Va.  
Hall, E. R., Miami, Fla.  
Hammond, Clarence and Nina, Malin, Ore.  
Hansen, Floyd, Waukegan, Ill.  
Hart, Wm. C., Washington, Pa.  
Hogan, Marvin H., Atlanta, Tex.  
Huckert, Mrs. Joe, Hereford, Tex.  
Henderson, Wayne, Sebring, Ohio.  
Kern, Roy, Scranton, N. Dak.  
Kindervater, John, Pottstown, Pa.  
King, Virgil, Springfield, Ohio.  
Kinney, Thomas A., Shelby, N. C.  
La Bella, Victor, Middletown, Conn.  
Landeck, John, Bensenville, Ill.  
Lowther, G. W., Alexandria, Ind.  
McGough, Robert, Milwaukee, Wis.  
McKinney, J. J., Indianapolis, Ind.  
McLaughlin, C. F., Birmingham, Ala.  
McPherson, Ross, Woodstock, Ont.  
Markle, Leonard, Greenfield, Ill.  
Mayernick, Joseph, Monessen, Pa.  
Mays, A. J., Devol, Okla.  
Manning, Walter, Milwaukee, Ore.  
Matullo, Louis, Washington, Pa.  
Merkle, Bob, Detroit, Mich.  
Meyer, Sgt. Danile, San Marcos, Tex.

#### Dx Reports by Station and Channel

##### Channel 2, 54-60 mc; 11 stations, 301 reports

KPRC, Houston, Texas .....	114	WCBS, New York City .....	24
CMQ, Havana, Cuba .....	32	WSB, Atlanta, Ga. ....	22
WMAR, Baltimore, Md. ....	28	WJBK, Detroit, Mich. ....	21
XEW, Mexico City .....	25	KNXT, Los Angeles, Calif. ....	7
WFMY, Greensboro, N. C. ....	25	KTSL, Hollywood, Calif. ....	2
KS2XBS, Chicago, Ill. ....	1		

##### Channel 3, 60-66 mc; 7 stations, 84 reports

KMTV, Omaha, Neb. ....	23	WBTV, Charlotte, N. C. ....	13
WTMJ, Milwaukee, Wis. ....	14	WKZO, Kalamazoo, Mich. ....	11
WPTZ, Philadelphia, Pa. ....	14	WDTV, Pittsburgh, Pa. ....	5
WLWC, Columbus, Ohio .....	4		

##### Channel 4, 66-72 mc; 30 stations, 258 reports

CMUR, Havana, Cuba .....	35	WHBF, Rock Island, Ill. ....	7
KRLD, Dallas, Texas .....	31	WNBW, Washington, D. C. ....	7
WKY, Oklahoma City, Okla. ....	30	WLWT, Cincinnati, Ohio ....	6
WMBR, Jacksonville, Fla. ....	17	WRGB, Schenectady, N. Y. ....	6
WTVJ, Miami, Fla. ....	17	WSM, Nashville, Tenn. ....	6
WTCN, Minneapolis, Minn. ....	15	WBKB, Chicago, Ill. ....	6
XHTV, Mexico City .....	14	KOB, Albuquerque, N. Mex. ....	5
WTAR, Norfolk, Va. ....	14	WBEN, Buffalo, N. Y. ....	4
WOAI, San Antonio, Texas ....	13	WNBK, Cleveland, Ohio ....	4
WOI, Ames, Iowa .....	13	KRON, San Francisco, Calif. ....	4
WMCT, Memphis, Tenn. ....	13	WWJ, Detroit, Mich. ....	4
WDAF, Kansas City, Mo. ....	12	KNBH, Los Angeles, Calif. ....	3
WBZ, Boston, Mass. ....	12	WAVE, Louisville, Ky. ....	1
WNBT, New York City .....	9	XELD, Matamoras, Mex. ....	1
WBRC, Birmingham, Ala. ....	8	WGAL, Lancaster, Pa. ....	1

##### Channel 5, 76-82 mc; 19 stations, 80 reports

WBAP, Ft. Worth, Texas .....	23	KSD, St. Louis, Mo. ....	2
CMQ, Havana, Cuba .....	10	WSAZ, Huntington, W. Va. ....	2
WOC, Davenport, Iowa. ....	7	WSYR, Syracuse, N. Y. ....	2
KTSP, St. Paul, Minn. ....	7	WABD, New York City .....	2
WTTG, Washington, D. C. ....	5	WAGA, Atlanta, Ga. ....	2
KEYL, San Antonio, Texas ....	5	WAVE, Louisville, Ky. ....	1
WNBQ, Chicago, Ill. ....	4	WEWS, Cleveland, Ohio ....	1
KTLA, Los Angeles, Calif. ....	3	KING, Seattle, Wash. ....	1
KPHO, Phoenix, Ariz. ....	2	KSL, Salt Lake City, Utah ....	1
KPIX, San Francisco, Calif. ....	1		

##### Channel 6, 82-88 mc; 11 stations, 57 reports

CMQ, Havana, Cuba .....	20	WTVR, Richmond, Va. ....	3
WDSU, New Orleans, La. ....	10	WHAM, Rochester, N. Y. ....	3
KOTV, Tulsa, Okla. ....	7	WOW, Omaha, Neb. ....	3
WTVN, Columbus, Ohio .....	5	WFIL, Philadelphia, Pa. ....	2
WFBM, Indianapolis, Ind. ....	3	WNHC, New Haven, Conn. ....	1

Millot, Dan, Louisville, Ky.  
Mulligan, Eldon, Ottawa, Ont.  
Nichols, Dan, Mason, Mich.  
Oberto, G. P., Richmond, Va.  
Patrick, M. C., Abilene, Tex.  
Penc, Stanley, Utica, N. Y.  
Randall, John W., Hanover, Mass.  
Rees, Mackworth G., Naples, Fla.  
Richards, Warsaw, Ind.  
Robins, Howard L., Tampa, Fla.  
Royal, Robert, Red Bay, Ala.  
Runnells, R. J., Ottumwa, Iowa.  
Sagel, Leslie, Wildwood, N. J.  
Samuels, Dan, Mt. Vernon, N. Y.  
Schmidt, Harry, Markham, Ont.  
Seay, J. Chester, Dothan, Ala.  
Simkin, Gordon, Orlando, Fla. and Arlington, Calif.  
Sloan, S. W., Braden Castle, Fla.  
Stanek, John A., New Kensington, Pa.  
Storie, Clarence A., Tulsa, Okla.  
Storch, Clarence L., San Antonio, Tex.  
Smith, B. L., Sundown, Tex.  
Tisdale, J. W., Tulsa, Okla.  
Tisdale, J. W., N. Little Rock, Ark.  
Van Sandt, R. L., Ft. Worth, Tex.  
Vanderstelt, Paul, Muskegon Heights, Mich.  
Wallace, William, Santa Anna, Tex.  
Warren, Bud, Cocoa, Fla.  
Waterhouse, F. T., Springfield, Mass.  
Whitfield, Lawrence A., Altoona, Pa.  
Wilcox, W. W., Richmond, Va.  
Wilkerson, S. W., Vancouver, B. C.  
Wilson, A. E., Port Arthur, Ont.  
Walker, John L., Albion, Pa.  
Yeager, Claude C., Wichita, Kan.  
96 observers, representing 29 States, plus Ontario, Nova Scotia, British Columbia and Cuba. **END**



# TWO MORE U.H.F. CONVERTERS

The Zenith v.h.f.-u.h.f. turret tuner and Mallory "Inductuner" preselector

By FRED KING\*

**Z**ENITH sets now have a new turret tuner designed for top performance on both u.h.f. and v.h.f. channels. The over-all size has been reduced considerably, the channel strips are easier to replace, and special shielding and parts placement minimize oscillator radiation.

Fig. 1 shows the new tuner with all shields in place. The a.g.c., B plus, and heater leads terminate in a plug and the i.f. output terminates in a coaxial connector so that the entire unit can be removed from the chassis for repair or replacing channel strips without removing the chassis from the cabinet.

Fig. 2 is the tuner with external shields removed. Two sets of the removable channel strips are shown in the foreground. Those nearest the tuner are u.h.f. strips. The oscillator and interstage circuits are on the right-hand segments and the antenna-r.f.-input circuits are at the left.

Fig. 3-a is a block diagram of the tuner circuit with a pair of v.h.f. channel strips in position. The triode section of the 6U8 is the local oscillator; the pentode section functions as the mixer. The twin-triode 6BK7 is a cascode i.f. amplifier. Fig. 3-b is a block diagram of the tuner with a pair of u.h.f. strips in position. All the circuit changes indicated in going from Fig. 3-a to Fig. 3-b are made by simply turning the turret from a v.h.f. to a u.h.f. channel.

Fig. 4 is a simplified schematic of the tuner on u.h.f. channels. There are two tuned circuits in the preselector and a tuned multiplier circuit. These three resonant circuits and the two crystals are mounted in a casting.

To cover all 70 u.h.f. channels the oscillator tunes from 172 mc to 234 mc. The germanium multiplier crystal acts as a harmonic generator to provide u.h.f. oscillator power for the mixer.

The germanium multiplier crystal is capacitance-coupled to the oscillator and conducts only on the extreme peaks of the oscillator sine wave. The

resultant straight-sided pulses in the multiplier circuit are rich in oscillator harmonics. The tuned output circuit of the multiplier selects the desired harmonic and applies it to the crystal mixer to beat with the incoming signal. The oscillator's third harmonic (516-702 mc) is used for the low u.h.f. channels and the fourth harmonic (688-936 mc) for the high u.h.f. channels. The mixer crystal is biased to operate at its point of maximum sensitivity, so that minimum oscillator power is required. The output of the mixer is at the 41-mc i.f. of the receiver. The 6BK7 and the pentode section of the 6U8 become additional 41-mc i.f. amplifiers to make up for the conversion loss in the crystal mixer.

The u.h.f. tuned circuits are very tiny. They are mounted in cylindrical holes in the casting about  $\frac{1}{4}$ -inch in diameter and  $\frac{1}{2}$ -inch deep. The antenna and multiplier coils are less than  $\frac{1}{2}$  inch long and  $\frac{1}{8}$  inch in diameter. Series-tuning capacitance for the preselector and multiplier circuits is provided by 1-72 machine screws which enter one end of each coil through an insulating bushing. The inductive coupling between the two preselector circuits is provided by a small pin pressed into a recessed hole in the casting between the two coils. The junction between the coils is returned to the casting through this pin, which is an inductance common to both circuits. The

casting shields the preselector and multiplier circuits from each other and from external influences.

The oscillator-interstage strip holds the oscillator coil with its disc ceramic capacitor, the cascode plate coil, and the mixer grid coil. The oscillator coil is adjusted to frequency by a small screw which enters the coil and changes its inductance. Each set of u.h.f. strips tunes over  $\frac{1}{3}$  of the band, so three sets cover all 70 channels.

Performance data supplied by the manufacturer is as follows:

Freq. (mc)	Channel	Noise Figure (db)	Image Rejection (db)	i.f. Rejection (db)	Relative Gain (%)
57	2	4.5	87	50	100
85	6	6.0	80	55	67
177	7	8.5	70	70	63
213	13	9.0	68	72	63
535	24	14.0	50	60	81
670	47	14.0	50	59	72
820	72	17.0	45	58	65

## Mallory u.h.f. inductuner

As a result of considerable experience in the design and construction of variable-inductance tuning mechanisms, Mallory developed a special Inductuner for continuous coverage of the 470-890-mc u.h.f. TV band. These u.h.f. Inductuners are available as one-, two-, three-, and four-section ganged units. The three-circuit model is shown in Fig. 5. Some manufacturers use these as the tuning systems in their converters.

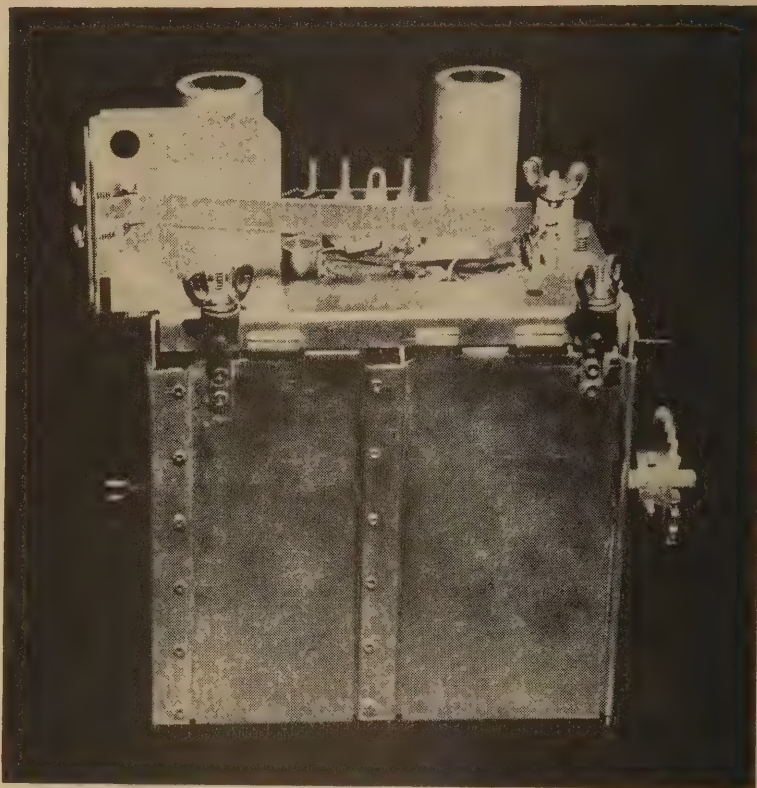


Fig. 1—The new Zenith v.h.f.-u.h.f. turret tuner with shields in place.

\*Chief Engineer, WELI, New Haven, Conn.



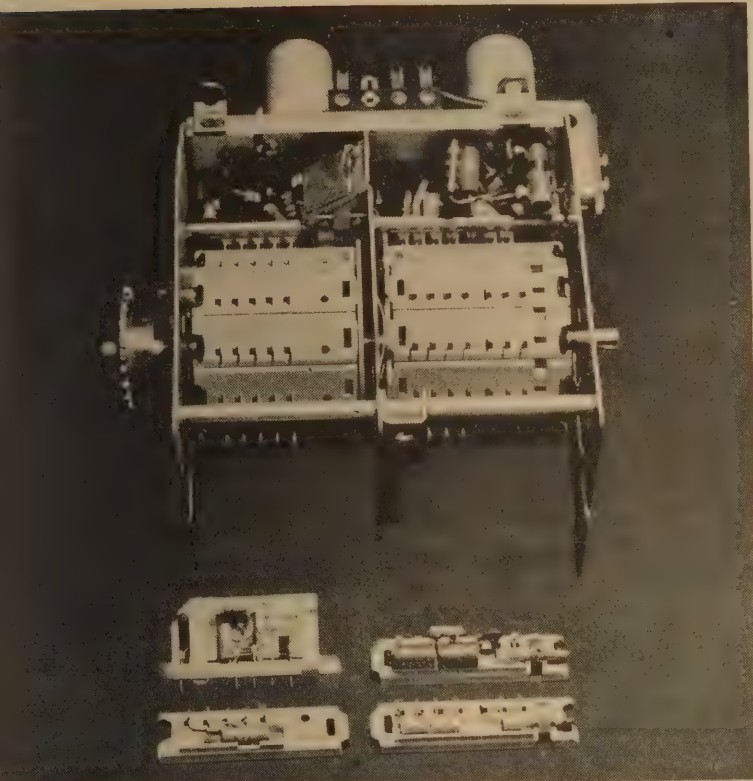


Fig. 2—The Zenith separate coil strip tuner with shielding removed.

Each Inductuner section employs a parallel-lines tuning system with the lines consisting of edge-mounted strips pressed into grooves in a mica-filled, phenolic-base material which provides mechanical strength and excellent electrical properties. They are arranged in a noninductive concentric path providing the required inductance range in  $270^\circ$  rotation of the shaft controlling the shorting bar. There are three different types of sections: wide-strip; narrow-strip; and shaped-strip tuning sections, to provide proper tracking in the preselector, mixer, and oscillator resonant circuits. Shaping of the elements provides more accurate tracking for various converter intermediate frequencies at approximately 40, 80, and 130 mc. The rotor arm which holds the dual contactor (shorting bar) is fastened securely to a phenolic shaft. Two-, three-, or four-section units may then be used without interaction.

Fig. 6 shows typical frequency versus dial-rotation curves for an 82-mc converter i.f. (channel 5 or 6). Measurements by the manufacturer show circuit parameters of individual Inductuner sections approximately as follows:

Distributed capacitance at maximum inductance .....	2 $\mu$ f
Maximum inductance .....	.04 $\mu$ h
Q at 100 mc. ....	180

These values vary slightly with dif-

ferent type sections. When used as preselectors with an external tank capacitance of 1  $\mu$ f, these units will tune the u.h.f. TV band with 10 mc to spare on each end. When used with a 6AF4 oscillator working on the low side of the signal, an external tank capacitance of 1.5  $\mu$ f is required.

### TV-101 u.h.f. converter

Figs. 7 and 8 show front and rear views of the Mallory TV-101 u.h.f. converter chassis. The schematic is shown in Figure 9. The converter—designed around a three-section Inductuner—covers channels 14 through 83. The antenna input impedance is 300 ohms, and the output impedance can be either 75 or 300 ohms. The popular line-up of preselector, crystal mixer, oscillator, and cascode i.f. amplifier is used. The gain is approximately 2 when used with the 300-ohm input and output. The converter i.f. is 82 mc so that either channel 5 or 6 may be used.

### Preselector

The preselector uses two sections (2 and 3) of the Inductuner to provide double-tuned selectivity and an impedance match ahead of the mixer. The preselector elements are shaped to track with the oscillator. The antenna coupling method is a compromise between energy transfer (from different types of antennas or lines), alignment problems, oscillator radiation, and noise figure. The r.f. chokes across the antenna terminals to ground act as static drains. They also act as capacitors in the u.h.f. band. Their capaci-

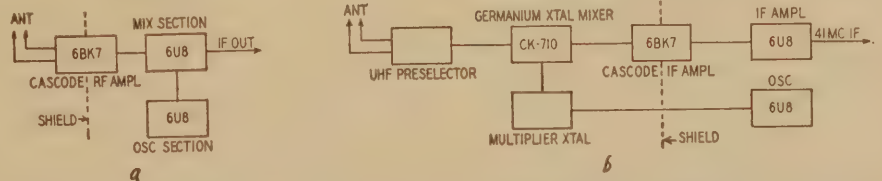


Fig. 3—(a) Block diagram of the Zenith tuner on v.h.f. channels. (b) Block diagram of the tuner circuit in one of the u.h.f. positions. Three sets of oscillator and preselector coil strips are required to cover all 70 u.h.f. channels.

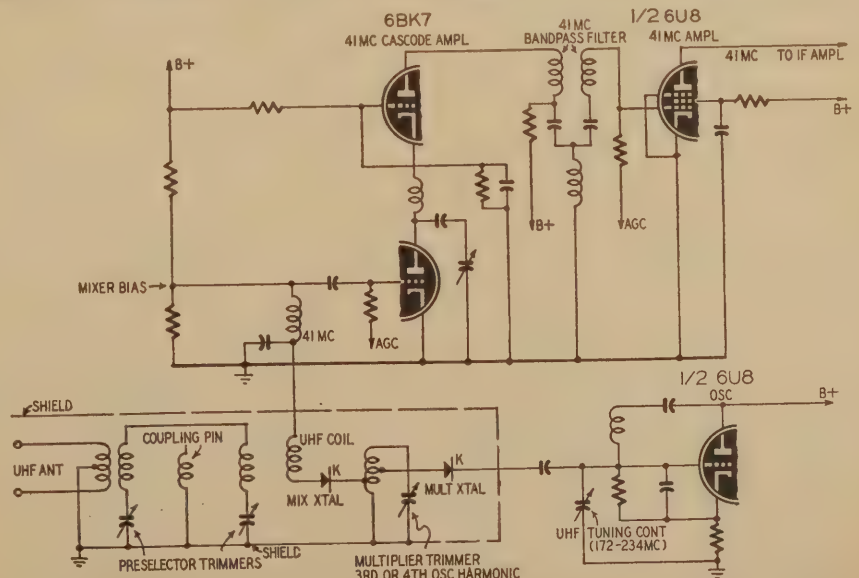


Fig. 4—Simplified schematic of the tuner circuit in one of the u.h.f. positions.



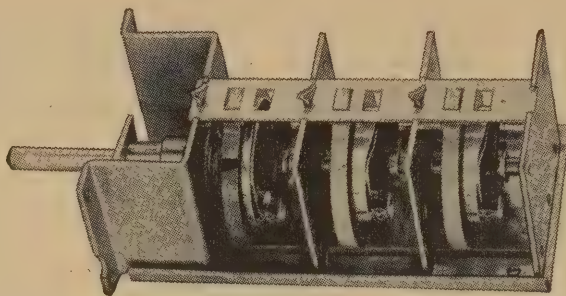


Fig. 5—A 3-section Inductuner. Note the concentric lines and wiper bars.

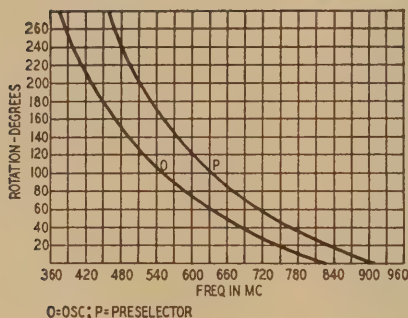


Fig. 6—Frequency versus dial-rotation curves for a converter i.f. of 82 mc.

tance to ground serves as an impedance tap-in on the first tuned circuit.

#### Oscillator

The oscillator tunes from 378 to 828 mc on the low side of the signal to develop a converter i.f. of 82 megacycles. Temperature compensation, careful location of parts, and isolating the i.f. and power-supply tubes from heat results in a stable oscillator. The drift is substantially zero at 700 mc. Drift is less than plus 400 kc at the low end of the u.h.f. band. At the high end, it is less than minus 750 kc. When operated with an intercarrier sound v.h.f. set, the converter stabilizes in about one minute. With split-sound receivers, a warmup period of three to five minutes may be required.

Oscillator injection voltage for the 1N72 crystal mixer is obtained by connecting to the 6AF4 heater, thus using the heater-cathode capacitance for coupling to the cathode. This results in less interaction between the preselector circuits and the oscillator. Measurements have shown that the maximum oscillator radiation is less than 2,000  $\mu$ v per meter at the top of the u.h.f. TV band and less than 600  $\mu$ v per meter at the low end at 100 feet from the converter.

#### Converter i.f. amplifier

The converter i.f. uses a 6BQ7 twin triode tube in a low-noise cascode circuit. The mixer output is transformer-coupled to the grounded-cathode first triode. Capacitance-coupling is used to the grounded-grid second triode. The circuit is neutralized by the r.f. choke in parallel with the grid-plate capacitance of the first triode. This choke also serves as the cathode return of the second stage.

The i.f. output circuit is a double-tuned transformer with a bandwidth of 14 megacycles at the half-power points with a center frequency at 82 mc. END

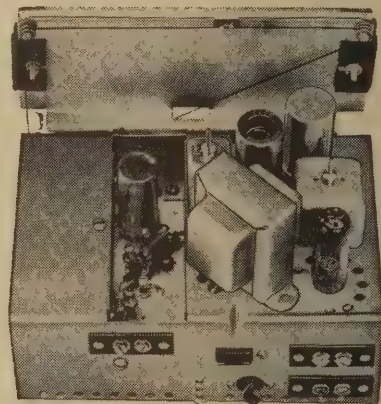
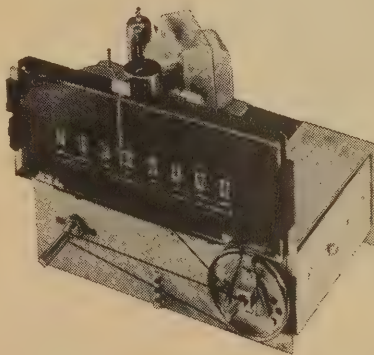


Fig. 7 (Left)—Mallory TV-101 u.h.f. converter.

Fig. 8 (Right)—Rear view of the Mallory TV-101.

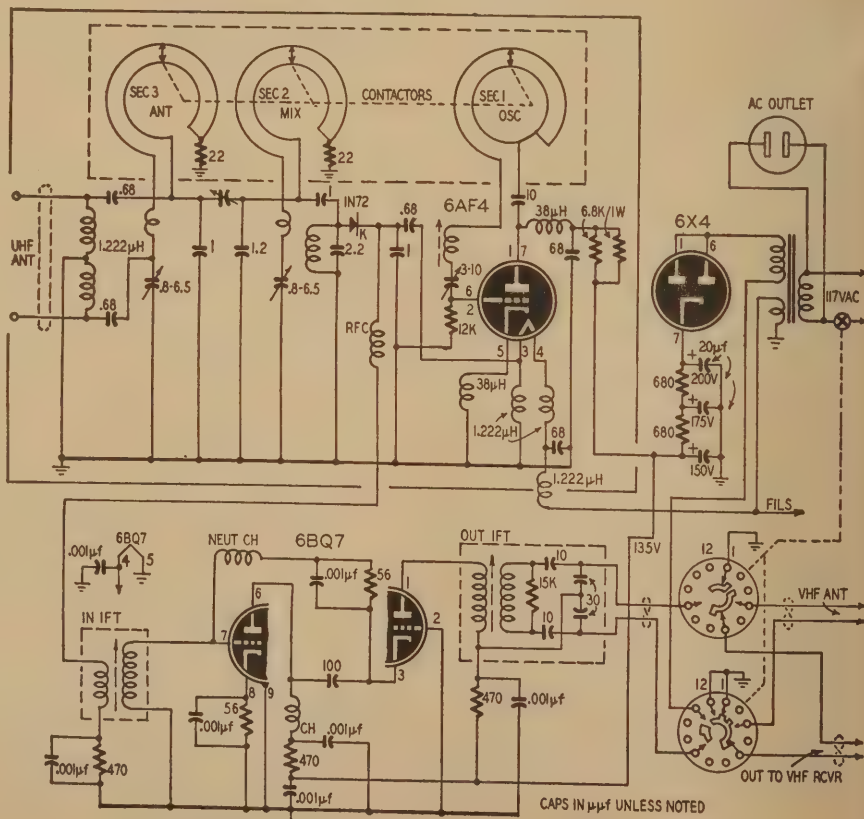


Fig. 9—Schematic of the TV-101 u.h.f. converter using the spiral Inductuner. RADIO-ELECTRONICS



# CIRCUIT SHORTS

Local-distance  
switching plus  
more anti-noise  
sync circuitry

By **ROBERT F. SCOTT**

Technical Editor

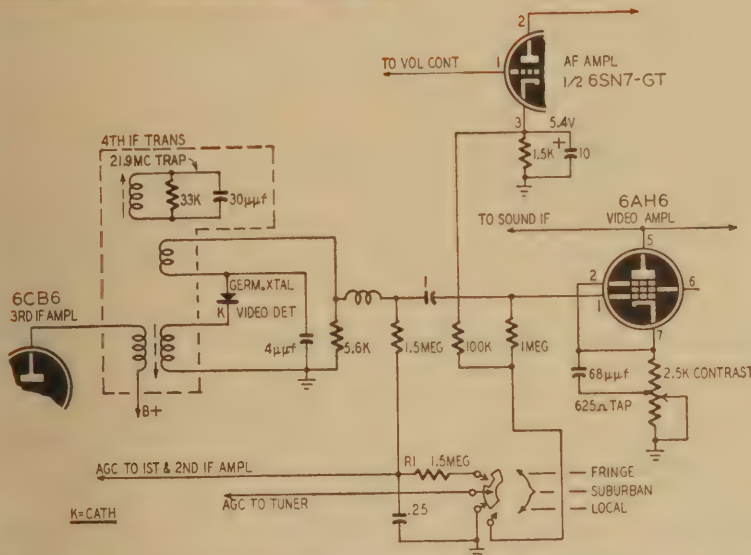


Fig. 1—Sensitivity-control switching in Motorola TS-400A TV chassis.

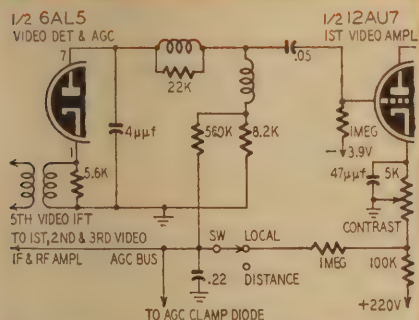


Fig. 2—Local-Distance switching used in Olympic TV models 762, 783, and 967.

**M**ANY modern television sets have auxiliary controls on the back for adjusting the sensitivity for optimum performance in weak-, medium-, and strong-signal areas. Fig. 1 shows the area-control circuit used in the Motorola TS-395A and TS-400A chassis. Slightly different versions are used in other late Motorola receivers. The LOCAL, SUBURBAN, and FRINGE settings adjust the sensitivity of the receiver for strong, medium, and weak signals, respectively.

In the LOCAL position, full a.g.c.—taken from the video detector output—is applied to the first and second video

i.f.-amplifier stages and through a 1.5-megohm isolating resistor (R1) to the r.f.-amplifier and mixer grids in the tuner. In the SUBURBAN position (that shown in Fig. 1) a.g.c. voltage is removed from the tuner, and the r.f.-amplifier and mixer grids are returned to ground. The FRINGE position is used when the incoming signals are weak, and the set must operate with maximum sensitivity. This grounds R1 and lowers the a.g.c. voltage on the i.f.-amplifier tubes to one-half the value applied in the LOCAL and SUBURBAN positions. In this position the video amplifier grid resistor is returned to ground to improve noise limiting ahead of the sync take-off point. The area selector control should be adjusted to the position which gives the clearest and most stable picture on all active channels.

## Olympic local-fringe control

The Olympic model 762 receiver has the local-fringe circuit shown in Fig. 2. When the switch is set to LOCAL (in strong-signal areas), the r. f. amplifier and first, second, and third video-i.f. amplifiers are supplied with the full a.g.c. voltage across the 8,200-ohm video-detector load resistor. In this position the a.g.c. line is connected through a 1-megohm resistor to the junction of a 100,000-ohm resistor and the contrast control. The arm of the control is grounded and the 100,000-ohm resistor connects to plus 220 volts.

When the signal is strong, the contrast control is usually adjusted for maximum resistance in the cathode circuit of the video amplifier. This

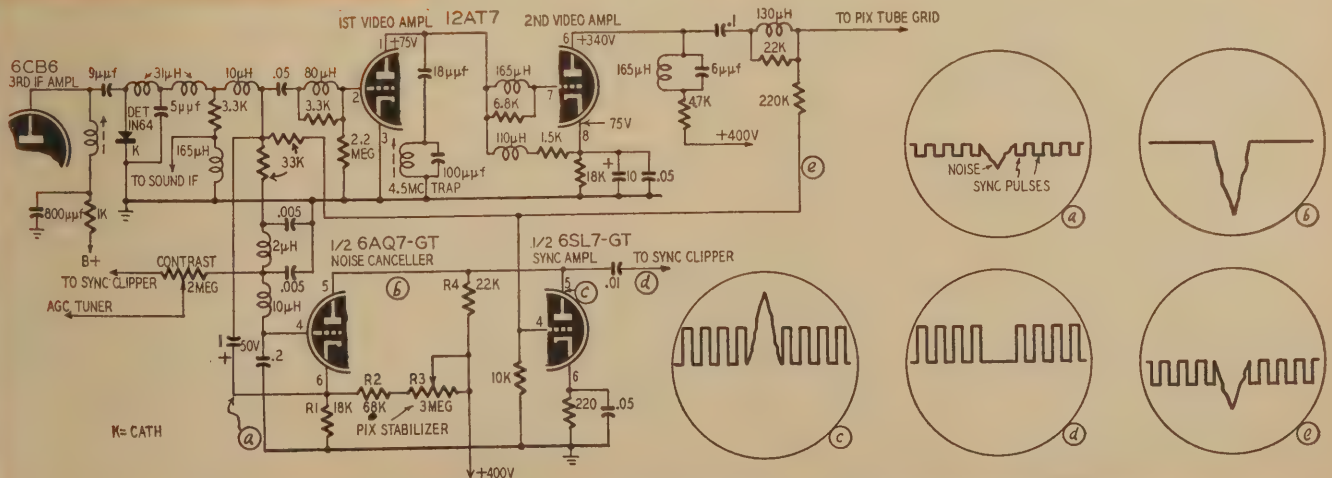


Fig. 3—Noise-canceller sync circuits of G-E 21T4 and 21T5 television receivers.



grounds the a.g.c. line through the 1-megohm resistor, and maximum a.g.c. voltage is used to reduce sensitivity and prevent overloading.

When the set is tuned to a weaker channel, the contrast control is moved up to reduce the bias on the video amplifier. A positive voltage now appears at the junction of the 1-megohm resistor and the lower leg of the contrast control. This positive voltage charges the 0.22- $\mu$ f a.g.c. filter capacitor and bucks the negative a.g.c. voltage across the detector load. This positive voltage (a.g.c. delay bias) prevents the a.g.c. voltage from reducing the circuit gain until the incoming signal is strong enough to overcome it.

Advancing the contrast control to compensate for weaker signals brings more of its resistance into the voltage divider circuit and increases the delay bias applied to the line. The bias varies from 0 to about 4 volts as the contrast control is varied from maximum to minimum setting. Thus, varying the control automatically sets the a.g.c. delay bias to the proper point for best operation. In weak-signal areas the switch is set in DISTANCE position, disconnecting the a.g.c. bus from the contrast control circuit.

## Noise-immune sync circuits

In past issues, we have discussed some of the various systems which manufacturers are using to insure maximum sync stability in the presence of severe noise.\*

Now let's look at Fig. 3 which shows the G-E noise-canceller circuit used in the 21T4 and 21T5 models. The circuit is designed to prevent noise from entering the sync-clipper circuit and causing loss of sync through premature triggering of the sweep oscillators.

The composite video signal from the video detector is fed through a cascaded two-stage video amplifier into the grid of the picture tube along with any noise pulses which may be picked up with the signal. The negative-going sync pulses and noise (e) are tapped off the grid of the picture tube and fed to the grid of the sync amplifier ( $\frac{1}{2}$  6SL7-GT). This combination of noise and sync pulses is amplified and appears with positive polarity at the plate of the 6SL7.

At the same time that the amplified noise and sync pulses appear at the grid of the sync amplifier, the *unamplified* negative-going noise and sync pulses (a) from the video detector output are applied to the cathode of the 6AQ7 noise-canceller tube through a 1- $\mu$ f coupling capacitor. The grid of the 6AQ7 is biased negatively from the a.g.c. line. The cathode is biased positive by returning it to a point on a voltage divider composed of R1, R2, and the PICTURE STABILIZER R3. Control R3 is set so the 6AQ7 is biased to cutoff until the negative-going noise pulse

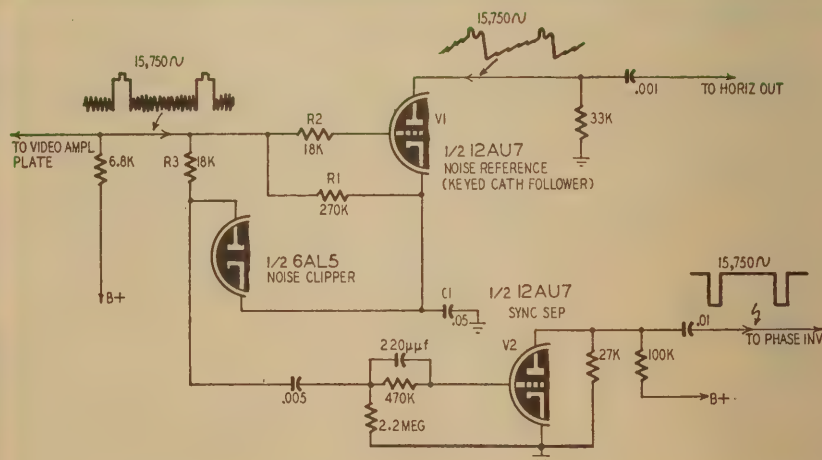
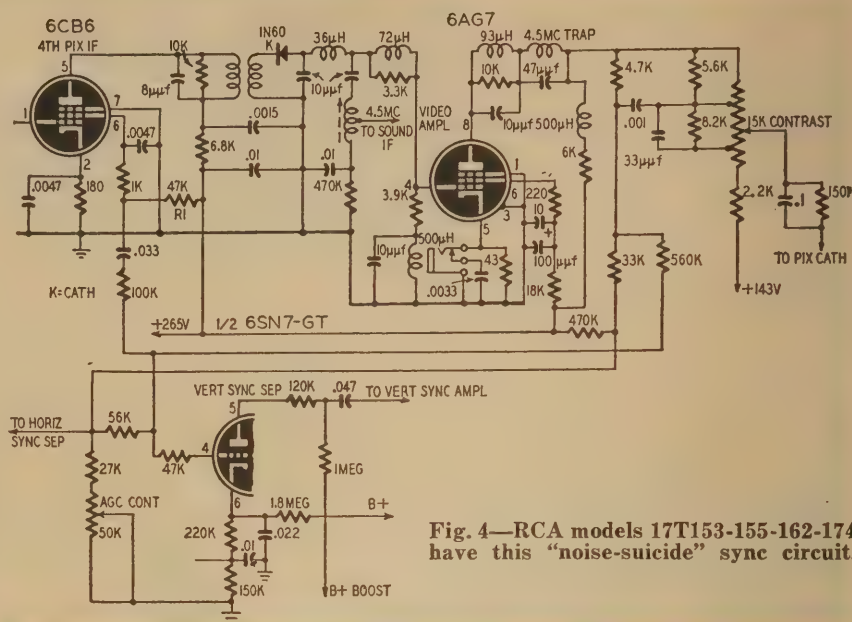


Fig. 5—Stromberg-Carlson receivers use this keyed noise-clipper sync circuit.

on the cathode exceeds the amplitude of the sync pulses. R4 is a load resistor common to the 6SL7 and 6AQ7. The 6AQ7 operates as a grounded-grid amplifier with input and output signals in phase. Since the two output signals are of opposite polarity, the waveform across R4 at any time will be the algebraic sum of the two signals. When the 6AQ7 conducts, it shunts the output of the sync amplifier and prevents any signal from being fed through to the sync clipper.

Waveforms *a*, *b*, *c*, *d*, and *e* show the operation of the circuit. Waveform *a* is the unamplified composite video with a superimposed noise burst. The waveform at the plate of the 6AQ7 during conduction is shown in waveform *b*. The pattern at *c* would appear at the plate of the 6SL7-GT if the 6AQ7 were heavily biased or removed from the circuit. The pattern at *d* shows the result of combining the waveforms at *b* and *c* in the common load resistor *R*.

longer than the time of several horizontal lines, all sync information is wiped out, but sync is not lost because of the flywheel characteristics of the sweep generator.

### RCA noise-suicide circuit

A number of recent RCA TV receivers employ a *noise-suicide* circuit which prevents noise from causing vertical jitter in weak-signal areas. The video i.f. amplifier strip is designed so the grid of the fourth video i.f. tube (Fig. 4) does not draw grid current with normal signal levels. However, strong noise pulses drive the grid positive.

Each time a noise pulse arrives, grid current flows, and negative pulses appear in the plate and screen-grid circuits. The negative pulse across the 47,000-ohm screen resistor (R1) is tapped off and fed to the grid of the vertical sync separator ( $\frac{1}{2}$  6SN7-GT) through an R-C network consisting of a .033- $\mu$ f capacitor and 100,000- and

\* Zenith's Fringelock—July, page 38.  
Philco noise-immune sync—September, page 45.







# TELEVISION?

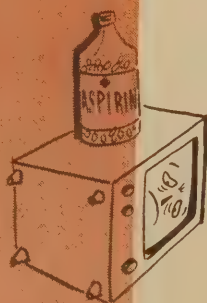
## it's a cinch!

By E. Aisberg

Translated from

La Télévision? . . . Mais c'est très simple!

by Fred Shunaman



### First conversation: Frequencies, v.h.f., and video.

WILL—Ken, I need some advice for my Uncle Jack.

KEN—O.K.—something about his radio, I suppose?

WILL—Not exactly. He's interested in television now. He's had a bad attack of arthritis, so he hasn't been able to get out of the house for a couple of months. You know what a movie fan he's always been. So now that he can't get out to see five pictures a week, he wants to get a TV set to bring the movies to him.

KEN—Good idea! I'll be glad to lend a hand. Let's drop over to your uncle's right now, and see where we can put up the antenna.

WILL—That's not going to be so easy. Didn't you know my uncle has been living in northern Maine for almost a year now?

KEN—Why didn't you tell me? You'd better just get your uncle a case of aspirin. He won't get television in northern Maine—at least not till we get a few more stations.

WILL—Why not? What about the programs from the Empire State Building?

KEN—He can't even get programs from Massachusetts stations. Sixty miles is about as far as you can be sure of getting dependable TV reception. Sometimes you may pick up programs a lot farther away. But your uncle in northern Maine hasn't much chance of getting entertainment out of a TV set.

### The earth is round

WILL—If TV stations don't get out any better than that, why don't they increase their power?

KEN—Because it wouldn't help—much. Most television is transmitted between 54 and 216 megacycles, in what they call the very-high-frequency band—between 30 and 300 megacycles; or on *ultra-high frequencies*, which means in the spectrum between 300 and 3,000 megacycles. The u.h.f. TV band runs from 470 to 890. Now, the higher you go in frequency—or the shorter the waves get, if you like to put it that way—the more they act like light waves. Longer radio waves—like those in the broadcast band—can bend and follow the curve of the earth, but v.h.f. waves travel in straight lines and can't get around the bend in the earth's surface.

WILL—Does that mean that the receiving antenna must be in sight of the transmitting antenna to pick up TV signals?

KEN—Well, not quite. Of course, what the engineers call "optical visibility" is best for reliable reception. But v.h.f. waves are a lot longer than light waves and are not quite so set on following a straight line. V.h.f. waves do reach a little beyond the visible horizon, and can curve around small obstacles.

WILL—Wait a minute! I think I get it. Because the earth is round, its curvature hides the transmitting antenna after a certain distance. The waves travel in straight lines, so they just keep on going over our heads and out into space?

KEN—You've just described in one sentence what has been called "The Tragedy of Television."

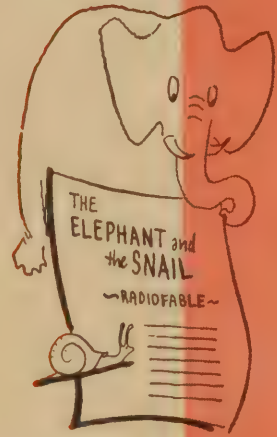
WILL—Why "tragedy"?

KEN—Because that's what makes it tough or impossible for large areas of

RADIO-ELECTRONICS



Readers of RADIO-ELECTRONICS can start with this issue what is probably the world's greatest book on the fundamentals of television. It has already been published in the original French, in German and in Spanish, and is in process of translation into Italian. The author, E. Aisberg, is the publisher of the French magazines *Toute la Radio*, *Télévision*, and *Radio Constructeur et Dépanneur*. He has also written many books on electronic subjects, including the famous *La Radio—Mais c'est tres simple!* to which this book is the television sequel. *Television—It's a Cinch!* is translated from the original French by special arrangement with M. Aisberg. RADIO-ELECTRONICS has the exclusive North American rights for the translation of *La Television?* . . . *Mais c'est tres simple!* and no extract from it may be published without our permission and that of Mr. Aisberg.



"...getting an elephant in a snailshell."

the country to get good TV service. The transmitting range is so short that it would be too costly to put up enough stations to cover the whole country.

### Getting up in the air

WILL—Isn't there any way of getting around this "tragedy"? Maybe people who live too far from TV stations could find some way of hooking onto those waves that are going by way over their heads. Why couldn't they use kites or captive balloons to hold up their antennas?

KEN—I don't think any TV set owner has gone that far, but some communications companies use antennas on captive balloons (Kytoons) to test sites for antenna towers. Most TV stations try to get their antennas as high as they can, though. That's why you see television antennas on the Empire State Building, on Mount Wilson, and on other such high points.

WILL—So you see there is a way out! Why do they make such a good start and then stop short?

KEN—I don't get you.

WILL—Why don't they put the transmitter in an airplane, and get up even higher? A plane flying around in the stratosphere could cover a quarter of the country, and my uncle Jack could see his flickers!

KEN—Congratulations, Will! You've just invented *stratovision*. That's what Westinghouse called just such a system some years ago. But they don't seem to have got it on a practical basis yet.

### Shedding a little light

WILL—Then why in blazes do they have to keep television on such short waves? Just because it's so new is no reason for putting it in the third sub-basement. Can't we reallocate or shut down three or four broadcast stations or commercial transmitters and put TV on the short or medium waves—where it really ought to be? Just think, if we only had one wavelength in the broadcast band we could put up three or four stations strong enough to cover the whole country. . . .

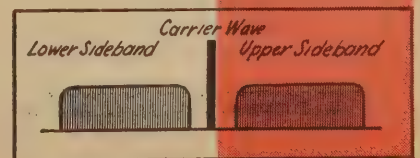
KEN—You're off the deep end that time, chum! Getting TV into the broadcast band would be about as easy as getting an elephant into a snailshell.

WILL—What's the connection between an elephant and television?

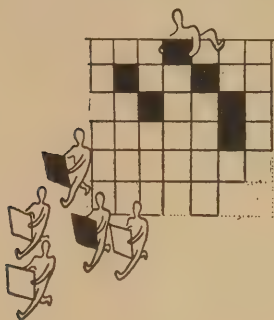
KEN—Easy, boy. Sit back and relax. Now think about the signals you get on your AM receiver. You have a carrier that sort of takes an audio signal along on its back. How wide a band does that need?

WILL—Well, the lowest audio notes are around 30 cycles and the highest about 15,000 cycles. I know for a fact, though, that most AM stations don't modulate much above 7,500 cycles.

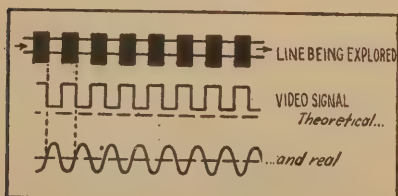
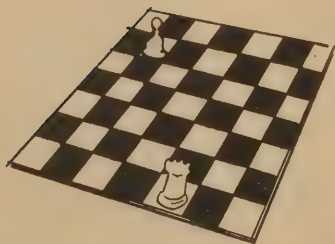
KEN—In other words, when you remember that you have the audio signal on both sides of the carrier, most AM stations have a bandwidth of 15 kilocycles. Did you ever stop to figure out why an AM station should be limited to 15 kc?







READING TIME...  $\frac{1}{2}$  min.



WILL—I may not know all the reasons, but the most important one is to cut down interference on adjacent channels. You couldn't get much above 5,000 cycles with the equipment they had when broadcasting started, and frequency allocations were made on that basis. Now the official signpost is 7,500 cycles for each sideband. Lots of stations go beyond that today, if they can do it without causing too much interference on neighboring channels. What's all this got to do with TV?

KEN—Plenty! But first, have you any idea of how television images are transmitted?

WILL—Of course! You can't transmit a whole picture at one time, so it's broken down into very tiny elements and then these elements are transmitted successively . . .

KEN—Whoa! You lost me there, chum! What's this with "elements" and how do you mean "transmitted successively"?

WILL—Ever look real close at a picture in a newspaper?

KEN—Yes.

WILL—And it looked like what?

KEN—Like a bunch of dots—some light, some dark.

WILL—It's the same in TV. We take a picture and break it down into little bits, some light, some dark. Only we don't call 'em dots, we say *elements* (or sometimes points).

KEN—And this business about "transmitted successively"?

WILL—That's just the way the engineers say "one after another." The television transmitter changes each element into a voltage. Transmission is negative . . .

KEN—Hold it again! Just what is "negative transmission"?

WILL—It just means that the dark part of a picture produces more voltage than a light part. A black element produces the strongest voltage.

KEN—And a point that isn't so black?

WILL—Just that much less.

KEN—And what if you have just a white space?

WILL—You can't catch me on that one. A white space gives zero voltage.

KEN—Or at least a very low one. But how do we manage to pick out all the points of a picture and then transmit them one after another?

WILL—Easy. A scene is scanned exactly like you'd read the lines on the page of a book. You could think of each letter as an image element. All the lines on a page are scanned one after the other to form an image. When we've finished one page, we start scanning the next one . . .

KEN—Correct! And how fast is this "reading" done?

WILL—Well, the pictures have to follow each other fast enough so the eye sees one continuous moving picture. The movies use 24 pictures a second. In television they follow each other at the rate of 30 a second.

KEN—Or about half a minute to read "Gone with the Wind"! But we're getting away from why we don't have a TV station in the broadcast band.

WILL—Go ahead. I'm listening.

KEN—We've agreed that the voltage produced by any picture element depends on how dark it is. So when we transmit a signal that describes all the elements of a television scene, we're going to jump around from a very large voltage for a dark element to a very weak voltage for a bright one. And we're going to transmit all the elements of a complete picture in  $1/30$ th of a second. Does that mean that the sidebands will be very wide?

WILL—Does it?

KEN—It certainly does! This signal that expresses the brightness of each element in a TV picture is called a *video-frequency* signal. It's really a wide band of frequencies—something like the audio frequencies in an AM receiver.

WILL—I suppose it can even be zero frequency sometimes. If you televise an all-white or all-black surface, all the little elements will be the same, and will produce the same voltage while the whole surface is being scanned.

KEN—That's true. But if the elements along the line being scanned are *not* all of the same brightness, the signal voltage varies. Now, when is that variation fastest, or in other words, when will we get the highest video frequency?

WILL—Probably when a lot of adjoining elements in a line differ in brightness.

KEN—Exactly. The frequency is maximum when we scan a line composed of elements which are black, white, black, white, successively. The highest frequency you could get would be with an image made of black vertical lines one element wide, separated by white intervals, also one element wide.

WILL—Then each element would give us one cycle of signal, and . . .

KEN—Easy, boy, easy! A white bar produces a very weak voltage and a black bar a very strong one. So scanning two adjoining elements—one black and the other white—produces a weak and a strong voltage. As we scan, the voltage alternates from weak to strong, back to weak, and so on. It takes the two bars, one black and one white, to make one cycle. And since one cycle can interpret two elements of the image, the total number of cycles . . .

WILL—Is half the number of image elements!

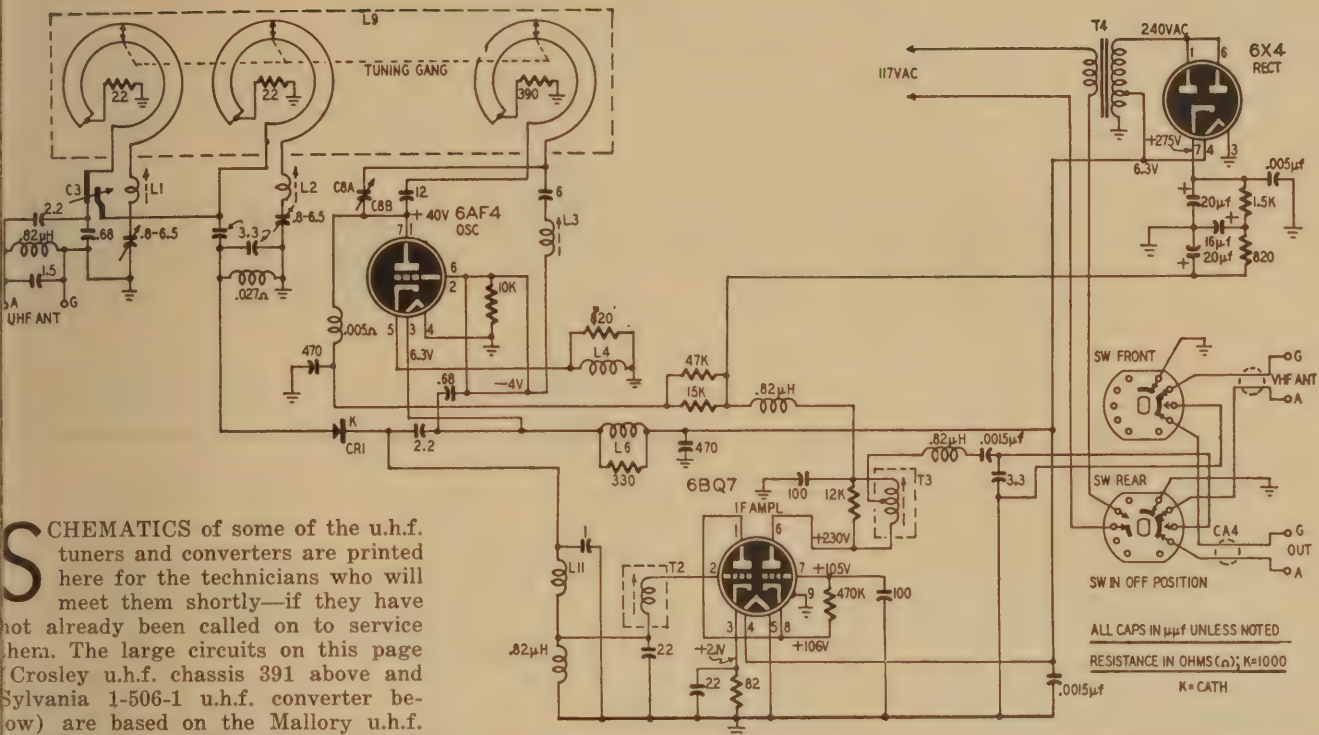
KEN—This time you're right.

(To be continued)

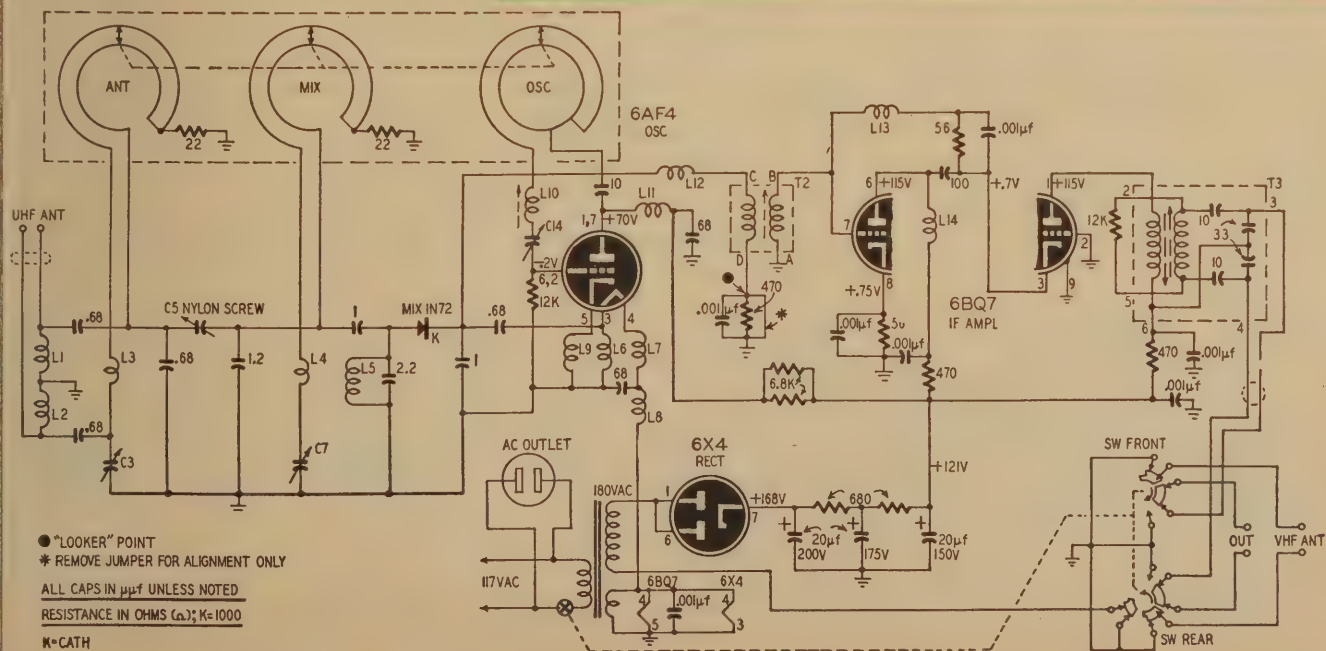
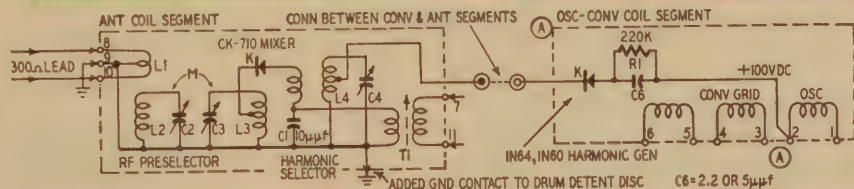
RADIO-ELECTRONICS



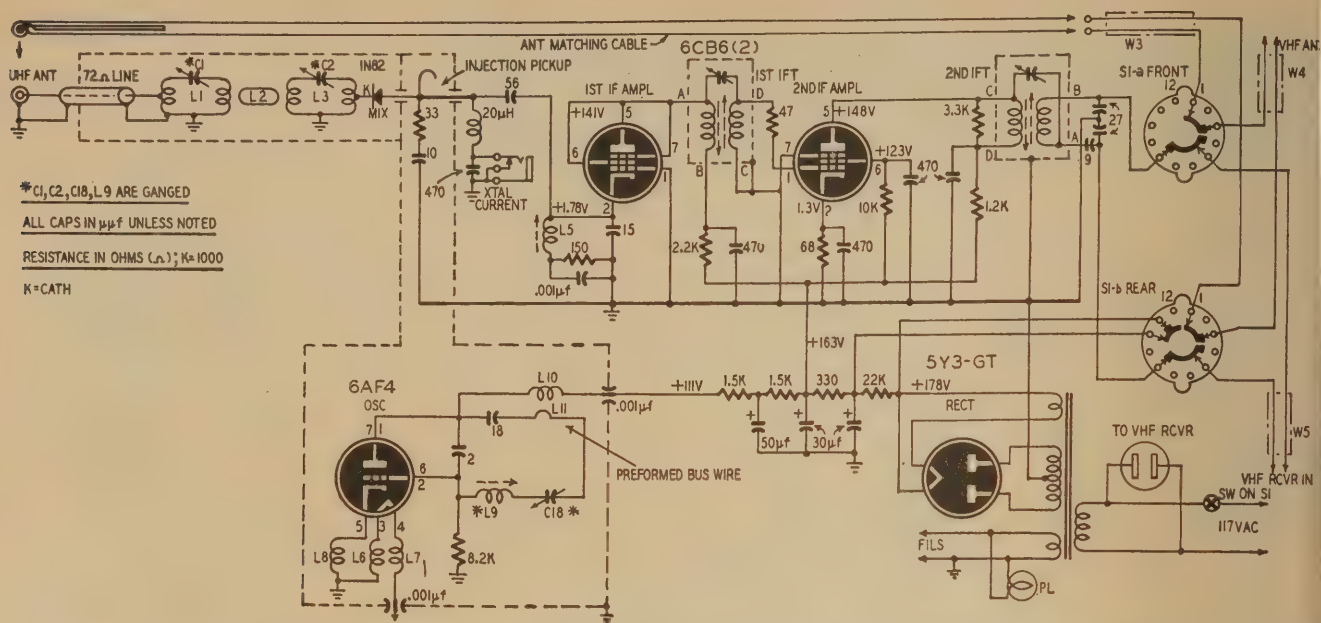
# UHF circuitry



**S**CHEMATICS of some of the u.h.f. tuners and converters are printed here for the technicians who will meet them shortly—if they have not already been called on to service them. The large circuits on this page (Crosley u.h.f. chassis 391 above and Sylvania 1-506-1 u.h.f. converter below) are based on the Mallory u.h.f. continuous tuner. The little diagram between them is the newer Standard Coil u.h.f. strip. Some of its components are electrical rather than physical. C2, C3, and C4 are capacitances between the brass screw and silver tab on the ceramic coil form. C6 may be 5  $\mu\text{f}$  or 2.2  $\mu\text{f}$  depending on the channel. L4, C4, and C1 form a circuit tuned to the 2nd, 3rd, or 4th harmonic of the local oscillator.





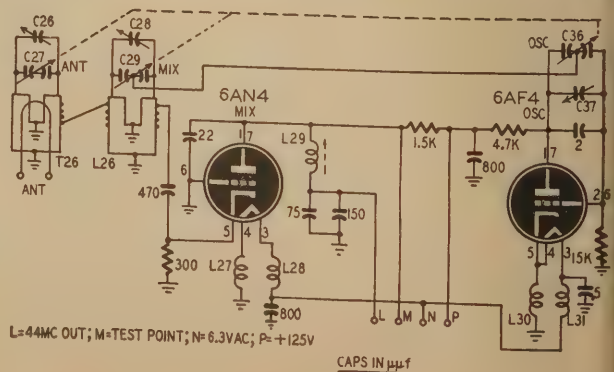
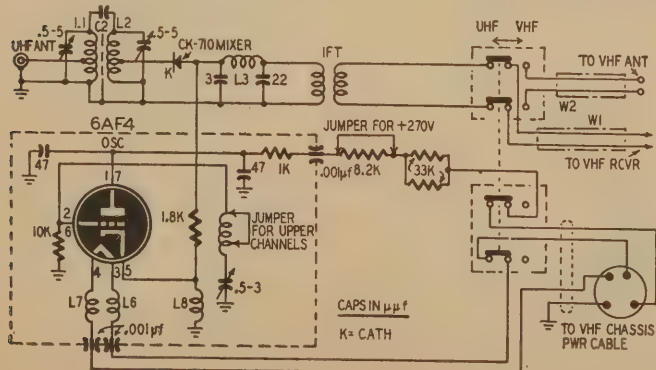
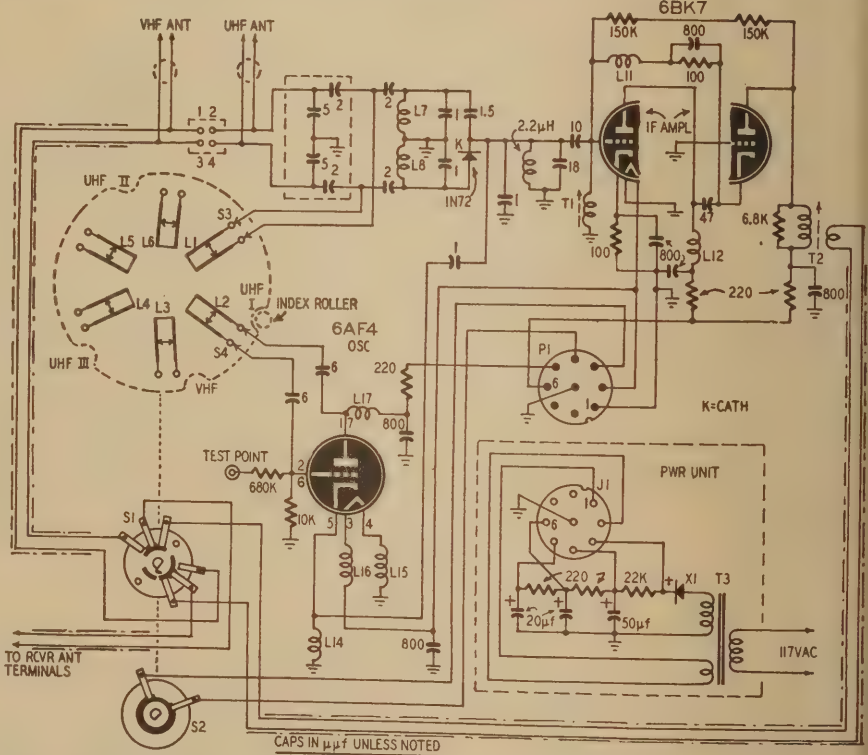


The circuit at the top of the page is the RCA u.h.f. selector U70. It covers the whole u.h.f. spectrum from channel 14 to 83. Its output may be on either channel 5 or 6, at 300 ohms, while the u.h.f. input may be either 75 or 300 ohms. (V.h.f. input is specified as 300 ohms balanced.) The TV receiver may be plugged into a receptacle on the selector, so that both v.h.f. receiver and selector can be operated by the selector's "on-off" switch. To receive v.h.f. programs, the switch is turned to v.h.f., which turns the selector on and puts it in stand-by condition. For u.h.f. signals, the switch is turned to U.H.F. and the v.h.f. receiver set to channel 5 or 6.

The schematic in the center is that of the G-E UHF-103 Translator described briefly in last month's issue ("More u.h.f. Converters", page 52).

Circuit at lower left is the RCA U1 (U1A, U1B), an adapter which permits receiving any single u.h.f. TV station when employed with a v.h.f. receiver. Its output is also on channel 5 or 6. U1A has a 7-pin miniature adapter socket for use with sets having a 6AQ5 audio output stage; U1B has an octal socket for use with a 6K6 or 6V6 output socket.

Diagram at lower right is the tuner used with the Sylvania chassis 1-510-2 and labelled in their schematic "Sarkes Tarzian u.h.f. tuner."









# TELEVISION ANTENNA PRODUCTS DIRECTORY

**All Channel Antenna Corp.**  
70-07 Queens Blvd.  
Woodside 77, N. Y.

Motorless all-direction, high-gain, broad-band, v.h.f. and u.h.f. antennas; bi-directional double-double V's; turnstile antennas; biconicals with mirror-image reflectors; super-directional fans, folded high-folded low, straight high-straight low, antennas; fan dipoles; v.h.f. and u.h.f. 5-, 8-, and 10-element Yagis; special u.h.f. high-gain reflectors; special-purpose antennas. 32 models. Masts; antenna switches.

**Alliance Mfg. Co.**  
Lake Park Blvd.  
Alliance, Ohio  
Antenna rotators.

**Alpar Mfg. Corp.**  
1486 El Camino Real,  
San Carlos, Calif.

Standard aluminum vertical antennas or antenna towers in two types: tubular TV and amateur type in 12-foot sections to rise 132 feet; triangular broadcast and communications type in 12-foot sections to rise 300 feet.

**American Phenolic Corp.**  
1830 S. 54 Ave.  
Chicago 50, Ill.

In-line antennas, single-bay and stacked arrays, piggy-back and indoor antennas, u.h.f. antennas and reflectors. Lightning arresters, standoff insulators, and mast sections.

**Antenna Products**  
3628 N. Lincoln Ave.  
Chicago, Ill.

Folded dipole arrays, 5- and 8-element Yagi antennas; 6-, 8-, 10- and 12-element conical arrays; single and stacked V's; u.h.f. corner-reflector, Yagi, V and parabolic antennas. Thirty-two antenna models. Masts, fittings, mounts, wire, accessories.

**Baker Mfg. Co.**  
Evansville, Wisc.

Forty-foot tower; 20-, 30- and 40-foot telescopic masts; double rock-up foot mount and peak roof mount.

**Beacon Corp.**  
2846 Milwaukee Ave.  
Chicago 18, Ill.

Spiral-type horizontal-element indoor antenna. One model, in aluminum or gold anodized finish.

**Bell Television, Inc.**  
552 W. 53rd St.  
New York 19, N. Y.

Amplified master antenna systems, individually engineered for each installation.

**Birnbach Radio Co., Inc.**  
145 Hudson St.  
New York 13, N. Y.

Indoor flexible folded dipoles, u.h.f. antennas, aluminum ground wire, rotator cable, RG-59/U coaxial cable, ground rods, loom, standoffs, guy wire, guy-wire kits, lightning arresters, filters, anchor bolts, mounting straps, clamps, couplers, switches.

**Blaco Mfg. Co.**  
6541 Euclid Ave.  
Cleveland 3, Ohio

Adjustable ground clamps and standoff straps.

**Blonder-Tongue Laboratories**  
526-536 North Ave.  
Westfield, N. J.

Line-amplifiers, mixer amplifiers, distribution units, line splitters, matching transformers, line-loss equalizers, weatherproof housings, remote-control units.

**Camburn, Inc.**  
32-40 57th St., Woodside 77, N. Y.  
Super-X conicals and biconicals, 5-, 8-, and 10-element Yagis, window antennas, masts, indoor dipoles, Zoom-up antennas, straight-line and V antennas. Installation accessories. Eighteen models.

**Cass Machine Co.**  
691 Antoinette St.  
Detroit 2, Michigan

Conical, single, stacked and double-stacked antennas; hi-low, in-line, and indoor antennas. Less mast or kit form. Side mounts, roof mounts, hardware. Thirty antenna models.

**Channel Master Corp.**  
Ellenville, N. Y.

V.h.f. antennas including Yagis, broad-band Yagis, fan antennas, high-low combinations, and 10-element Yagis. U.h.f. triangular dipoles with or without screen, stacked V's, corner reflectors and Yagis. Combination u.h.f.-v.h.f. antennas. Telescoping masts, triangular towers, and other accessories.

**Copperweld Steel Co.**  
Glassport, Pa.

Ground rods, stranded guy wire, grounding wire, and single conductor antenna wire.

**Davis Electronics**  
4313 W. Magnolia Blvd.  
Burbank, Calif.

Special type all-channel v.h.f. "Super-Vision" antenna. One model. U.h.f. antenna.

**Easy-Up Tower Co.**  
427 Romaine Ave.  
Racine, Wis.

TV towers, three models; roof mounts, twelve models; antenna accessories.

**Energy Farm Equipment Co.**  
Monticello, Iowa

Hydraulic sectional TV mast, compressed height 22 feet, extended height about 60 feet.

**The Finney Co.**  
4612 St. Clair Ave., Cleveland, Ohio  
U.h.f. and v.h.f. ultra-high-gain fringe-area TV antennas. Communication and special purpose antennas.

**Freteco, Inc.**  
1041 Forbes St.  
Pittsburgh 19, Pa.

Yagis, conicals, v.h.f., u.h.f., broad-band, collinear arrays, "Fretarays," corner reflectors, dipoles, special arrays, slot antennas. Sixty models.

**Gadgets, Inc.**  
3629 N. Dixie Dr.  
Dayton, Ohio  
"Circlatron" indoor circular adjustable dipole.

**Gee-Lar Mfg. Co.**  
1330 10th Ave.  
Rockford, Ill.

Single-, 2-, and 4-bay all-channel conical antennas. Three models.

**General Cement Mfg. Co.**  
919 Taylor Ave.  
Rockford, Ill.

Single-, 2-, and 4-bay all-channel conical antennas. U.h.f. double-X and special bow-tie conical.

**Gleam Mfg. Co.**  
740 N. Leavitt St.  
Chicago 13, Ill.  
Model-boat type indoor antenna. One model.

**Gonset Co.**  
801 S. Main St.  
Burbank, Calif.

U.h.f. and v.h.f. fringe-area high-gain arrays. 375-ohm and 450-ohm open-wire line.

**Don Good, Inc.**  
1014 Fair Oaks Ave.  
South Pasadena, Calif.

U.h.f. and v.h.f. lead-in, open-line and sheathed against unfavorable atmospheric conditions. Two models (two colors each model). Interference traps and filters.

**Hamilton Electronics Corporation**  
2726 Pratt Avenue,  
Chicago 45, Ill.

Impedance-matching, isolating couplers for operating two to six TV receivers from a common antenna. Three models.

**Haydon Products Corp.**  
1801 8th Ave.  
Brooklyn 15, N. Y.

Stationary and adjustable chimney, wall, roof, eave, and pipe mounts; galvanized and stainless-steel strapping; mast-stand-off and screw-eye insulators; hardware. Forty models.

**Hi-Lo TV Antenna Corp.**  
3540 N. Ravenswood Ave.  
Chicago 13, Ill.

Indoor, outdoor spiral antennas, v.h.f., high-low bands inductively coupled. Two models, with stand or window mount.

**Hi-Par Products Co.**  
347 Lunenburg St.  
Fitchburg, Mass.

Dipole-reflector antennas, single and stacked; conicals; double diamonds; 4-, 5-, and 8-element Yagis; in-line antennas; Twenty-four models.

**Holub Industries, Inc.**  
413 DeKalb Avenue  
Sycamore, Ill.

Installation tools and hardware: masonry drills, lead-in clamps, screw anchors, wire strippers.

**Hy-Lite Antennae, Inc.**  
242 E. 137th St.  
New York 51, N. Y.

Wide-band-V, conical-V and conical antennas; low- and high-band folded and straight dipoles; single-channel 4-, 5-, 8-, and 10-element Yagis. Twenty-two models.

**I E Mfg.**  
325 N. Hoyle Ave.  
Chicago, Ill.

Wide- and narrow-band antennas, u.h.f. antennas, straight conicals, fringe-area clover-leaf antennas.

**Imperial Radar & Wire Corp.**  
4342 Bronx Blvd.  
Bronx 66, New York

Open-line lead-in wire, open-wire matching transformers, feed-through insulators; antenna and mast accessories.

**Insuline Corp. of America**  
3603 35th Ave.  
Long Island City, N. Y.

Yagi, stacked-Yagi, biconical, stacked-biconical, conical, stacked-conical, folded-dipole, stacked-folded-dipole, simple-dipole, stacked-simple-dipole, flexible-indoor, indoor-dipole, and window antennas. Masts, accessories, kits and preassembled units. Sixty-five models.

**Javex**

**P. O. Box 646, Redlands, Calif.**  
Custom-molded wall-plate antenna outlets in single-, double-, triple-, switching and dual-coupler types for flush mounting; antenna couplings, connectors, polarized plugs and sockets, combination plugs, sockets, terminals and junctions, feed-throughs, and antenna weatherheads.

**Jerrold Electronics Corp.**  
26th and Dickinson Sts.  
Philadelphia 46, Pa.

Master antenna systems for apartment houses, dealers, and communities; single-channel and wide-band amplifiers; distribution amplifiers; solderless coaxial-line connectors; antenna- and line-matching transformers; all TV distribution-system accessories.

**JFD Mfg. Corp.**  
6101 16th Ave.  
Brooklyn 25, N. Y.

"Jet 283" u.h.f.-v.h.f. all-channel conical, bow ties with straight reflectors, corner reflectors, and 6-element Yagis, ultra-V beams, rhombics, double and stacked V's. All-aluminum and part-aluminum conicals, single-stacked and 4-bay. All- and part-aluminum Yagis, single-channel, dual-channel and broad-band, single-stacked and 4-bay (in 5-, 10-element wide-spaced Baline models). 151 antenna models. Antenna kits, jumper bars, aluminum and steel telescoping masts, lock-joint and fitted-joint masts. Lightning arresters, single-channel boosters, two- and four-set couplers, pre-amplifying couplers, three- and four-way antenna switches. Mast mounts. Installation accessories. Wave traps. "NUT" universal Standoffs. Over 600 TV products.

**Jontz Mfg. Co.**  
1101 E. McKinley  
Mishawaka, Ind.

Towers, masts, and roof mounts.

**Kay-Townes Antenna Co.**  
Box 586  
Rome, Ga.

Broadside arrays, end-fire conicals, double-reflector conicals, V's, and special types; five models. Masts, two types—24-foot and 34-foot. Chimney mounts, roof mounts, installation accessories.

**Kenwood Eng. Co., Inc.**  
265 Colfax Ave.  
Kenilworth, N. J.

Eave, wall, and parapet antenna mounts. Antenna accessories and hardware.

**LaPointe Plasmacold Corp.**  
155 W. Main St.  
Rockville, Conn.

Q-Tee, broad-band, v.h.f. (three



models—single, double, quad); heavy-duty Q-Tee (three models—single, double, quad); Ultra Q-Tee, all v.h.f.-u.h.f. channels (2-83), (three models—single, double, quad). Ultra Q-Tee Suburban, broad-band v.h.f. fringe-area u.h.f. (three models—single, double, quad).

V.h.f. antennas: single-channel 4-, 5-, 12 element Yagis; broad-band collinear arrays; dipole-and-reflector models, conicals. Eighteen models. U.h.f. antennas: single-channel, 8-and 12-element Yagis; collinear, broad-band arrays; side-by-side-stack collinear broad-band arrays; broad-band primary-area V antenna and reflectors.

**Louis Bros.**  
3543 E. 16th St.  
Los Angeles 23, Calif.

Conical, folded-dipole, Yagi, double-V, and all-channel u.h.f. and v.h.f. antennas. Masts and antenna kits. Sixty-five models.

**Mechanical Steel Tubing Corp.**

1801 8th Ave.  
Brooklyn 15, N. Y.

Dualcote and Alumacote steel TV masts, 5- and 10-foot sections, 15-, 18-, and 20-gauge. Twenty-four models.

**Mosley Electronics**

2125 Lackland Rd.  
Overland 14, Mo.

Weatherproof lead-in entrances; lead-in flush sockets; TV-antenna switches; 2-set TV couplers; open-wire accessories; 300-ohm transmission line plugs, sockets, connectors, and splicers; rotator-cable connectors.

**Neal Electronics Co.**

505 Seminole  
Huntsville, Alabama

Five- and 10-element extra-high-gain Yagis; all-channel Yagi. U.h.f. Yagis, conicals, V's, and square-corner antennas now in process.

**Ohio Aerial Co.**

4553 Lewis Ave.  
Toledo 12, Ohio

Conical antenna (triple front-horizontal reflector bars) and stacked arrays. No distribution outside Michigan and Ohio.

**Peerless Products Industries**

812 N. Pulaski Road  
Chicago 51, Ill.

Indoor adjustable dipoles. Three models.

**Penn Boiler & Burner Mfg. Corp.**

Fruitville Road  
Lancaster, Pa.

Sectional towers, 10-foot sections, guy supported, to 100 feet and more; telescopic towers (with detachable hoist), 3 sections, guy supported, with maximum height of 29 feet plus pole height. Two models.

**Philson Mfg. Co., Inc.**

60-66 Sackett St.  
Brooklyn 31, N. Y.

Straight and folded dipoles, conicals, Yagis, double-V's, in-line antennas, and mounting brackets. Six different antenna types.

**Plymouth Electronics Corp.**

50 Kingsbury St.  
Worcester 10, Mass.

Roof, wall, and chimney mounts; guy wire; channel-transfer switches; couplers; interference filters. Fourteen models.

**Radelco Mfg. Co.**

7580 Garfield Blvd.  
Cleveland 25, Ohio

"Bar-X" all-channel, v.h.f. antennas, six models; hi-low all-channel, v.h.f. antennas, six models; in-line, all-channel, v.h.f. antennas, three models; all-channel u.h.f., one model;

indoor antenna, one model; single-channel Yagis; masts, wall and chimney mounts, ground rods, lightning arresters, other accessories.

**The Radiart Corp.**

3455 Vega Ave., Cleveland 13, Ohio

Broad-band and cut-to-channel antennas in all popular types. Thirty-eight models for v.h.f. U.h.f. models to be released soon. Indoor antennas, stacking kits, chimney mounts, lightning arresters.

**Radio Corporation of America**

415 S. 5th Street, Harrison, N. J.

Twelve-channel TV antennas, folded dipoles with reflectors, V attachments, reversible-beam arrays. Arresters, mounting brackets, guy rings, other accessories.

**Radio Merchandise Sales, Inc.**

2016 Bronxdale Ave.  
Bronx, N. Y.

Five-, 8-, and 10-element arrays, conicals (quick-rig and pre-assembled), end-fire-V arrays and conical V's; corner arrays, folded hi-low, straight hi-low, for v.h.f. and u.h.f.; window antennas, indoor antennas, masts, kits. Antenna switches, set couplers, chimney mounts, and all accessory hardware. Over twenty-six antenna models.

**The Radion Corp.**

1130 W. Wisconsin Ave.  
Chicago, Ill.

Porcelain and phenolic lightning arresters; indoor TV antennas, V-type straight dipoles for v.h.f. and u.h.f.; printed circuit antennas for v.h.f. and u.h.f.; conical and folded dipole outdoor antennas; masts, mounts, and related accessories.

**Ramsey Radio & Television Co.**

Box 297, Ramsey, Ill.

Welded tubular-steel towers for roof or ground mounting, in 10-foot sections, five models; telescoping steel masts, two models.

**Ray Co.**

441 Summit St., Toledo, Ohio

Four-way, motorless, nondirectional; diamond stacked dipole array. Six models.

**Rohn Mfg. Co.**

2108-10 Main St., Peoria 5, Ill.

Self-supporting steel towers, foldover towers and kits, drive-in tower bases, tower accessories. Six models.

**Walter L. Schott Co.**

3225 Exposition Place  
Los Angeles 18, Calif.

Directional, conical, and double-V wide-band arrays in various models; antenna kits; u.h.f. broad-band, corner-reflector, fan and double-V antennas. Fifteen models.

**S/C Laboratories, Inc.**

37 George St., Newark 5, N. J.

Six- and 8-element standard conicals; 6- and 8-element deluxe conicals; folded v.h.f. high-band adapter; dual-V.

**Snyder Mfg. Co.**

22nd and Ontario Sts.  
Philadelphia 40, Pa.

"Directronic" antennas, outdoor and indoor, for v.h.f. and u.h.f.; Yagis, biconicals; fringe-area high-gain "Directronics"; u.h.f. corner-reflector, Yagi, and bow-tie types; end-fire V's; kits; preassembled units; 300-ohm flat and Tri-A transmission lines; masts; antenna-mounting accessories. Thirty models.

**South River Metal Products Co., Inc.**

377-379 Turnpike  
South River, N. J.

Mounting brackets, chimney mounts, wall brackets, snap-in

mounts, vent-pipe mounts, adjustable wall brackets, peak and flat-roof mounts, eave mounts, guy rings and clamps, banding, banding replacement kits, ground rods, screw-type insulators, standoffs, mast tubing.

**Spirling Products Co., Inc.**

62 Grand St., New York 13, N. Y.  
Indoor antennas. Four models.

**Tabet Mfg. Co., Inc.**

254 W. Tazewell St.  
Norfolk 10, Va.

Sectional aluminum towers. Three models (Economy, 24 feet; Standard, 30 feet; Reinforced, 90 feet maximum height). Tower sections and equipment.

**Technical Appliance Corp.**

1 Taco St.

Sherburne, N. Y.

Broad-band, all-channel antennas, conical and high-low types for v.h.f.; u.h.f.-v.h.f. fan and reflector types; twin-driven 5-element and 10-element Yagis; indoor, simple-dipole and folded-dipole antennas. Seventy-three models. Accessories, mast mounts, lightning arresters, antenna amplifiers. Master antenna-distribution systems.

**Tel-A-Ray Enterprises, Inc.**

Box 332, Henderson, Ky.

U.h.f.-v.h.f. 3-, 5-, and 8-element Yagis. Broad-band butterfly antennas, window, attic, and 1-, 2-, and 4-bay arrays. Broad-band u.h.f. antennas. Fifty-six models. Steel towers.

**Television Laboratories, Inc.**

5045 W. Lake St., Chicago 44, Ill.  
Printed-circuit antennas, built-in u.h.f. and v.h.f. antennas, under-rug antennas. Eleven models.

**Television Radio Electronics**

Route No. 1, Box 291  
Merced, Calif.

V.h.f. 10-element in-line Yagi, u.h.f. 5-element Yagi with screen or reflector; corner-reflector u.h.f. bow-tie antennas; 5-element cut-to-channel v.h.f. antennas.

**Telrex, Inc.**

Asbury Park, N. J.

V.h.f. conical-V-beams, Yagis, window antennas, indoor "Bat-Wings"; u.h.f. conical-V-beams, duplex Yagis, double-V-beams, corner reflectors; masts and accessories. Sixty models.

**Tempo TV Products**

2450 Ramona Blvd.  
Los Angeles 33, Calif.

Fourteen sizes of steel telescopic masts, from 20 to 80 feet.

**Tennalab**

Quincy, Ill.

V.h.f. multichannel Yagis; v.h.f. and u.h.f. single-channel Yagis; v.h.f. all-channel array. Forty-nine models.

**Tenna-Trailer Co.**

321 N. Plum St., Pontiac, Ill.

Portable two-wheeled unit with telescoping 50-foot mast for demonstrating TV in fringe areas. Lightweight 50-foot mast for permanent installations. Three models.

**Thomas Mold & Die Co.**

Box 126, Wooster, Ohio

Hydraulic-telescoping, 40-, 60-, 80-, and 100-foot steel or aluminum masts. Masts to 200 feet and mobile units to specifications.

**Tricraft Products Co.**

1535 N. Ashland Ave.  
Chicago 22, Ill.

Loaded dipoles, hi-low folded dipole and reflector, single and stacked conical types, cut-to-channel Yagi, all-wave Yagi, electrically loaded and covered-spiral indoor types, window an-

tennas, u.h.f. antennas, masts; kits and preassembled units. Twenty-nine models.

**Trio Mfg. Co.**

Griggsville, Ill.

Wide-band high-gain Zig-Zag antennas for all v.h.f. channels. Eight models.

**TV Development Corp.**

2024 McDonald Ave.  
Brooklyn 23, N. Y.

All-band conicals, V's, folded and straight dipoles with reflectors, indoor antennas, and masts. Six models.

**T-V Products Co.**

152 Sandford St.  
Brooklyn 5, N. Y.

Wide- and narrow-band arrays, 5- and 10-element Yagis, single and twin-driven-, preassembled- and plug-in type conicals, hi-low folded and straight dipoles, in-line antennas, V-type end-fire arrays, u.h.f. broad-band and single-channel types. Chimney, wall, and peak roof mounts, mast-joiners, antenna hardware. 132 models.

**Unimac Division**

Marvin Radio-Television  
8906 Buckeye Rd.  
Cleveland, Ohio

Chimney mounts, 6-, 12- and 18-inch wall mounts.

**Universal Products**

4100 Taylor Ave., Racine, Wis.

Conical antenna, one model; roof mounts, four models; steel towers, three models; masts, four models.

**Video Electronic Laboratory**

304 Ridgers Road  
Des Moines, Iowa

Broad-band antennas; 90° corner reflectors, and V-type dipole and reflectors for v.h.f. band. U.h.f. corner reflectors and horizontally polarized helicals. Ten models.

**Walnut Machine Co., Inc.**

1525 S. Walnut St.  
South Bend 14, Ind.

Aluminum all-channel v.h.f. antenna. One model.

**Ward Products Corp.**

Div. of the Gabriel Co.

1523 E. 45th St.  
Cleveland 3, Ohio

Combination u.h.f.-v.h.f. antennas, folded dipoles, in-lines, conicals, Yagis, in kit form and as preassembled units. Twenty-five models.

**Wells & Winegard**

1511 Mt. Pleasant St.  
Burlington, Iowa

Wide- and narrow-band arrays, combination-channel Yagis, and high-gain all-channel primary- and fringe-area arrays. Six models.

**Western Coil & Electrical Co.**

215 State St., Racine, Wis.

TV towers, guyed-triangular-pyramid, straight-side, and self-supporting types. TV hardware, fixed and rotary type guy rings.

**Wincharger Corp.**

E. 7th and Division Sts.  
Sioux City 2, Iowa.

Telescoping masts, guyed and self-supporting towers and accessories. Receiving- and transmitting-antenna masts and towers in all heights from 5 to 500 feet. Thirty models.

**Wind Turbine Co.**

E. Market St., West Chester, Pa.

"Trylon" antenna masts and towers. Nine models.

**Winpower Mfg. Co.**

Newton, Iowa

Four-post, pyramidal self-supporting, TV towers. Two models, 5 and 10 feet.

END



# TV comes to PORTLAND

Record installation speed  
gives "City of Roses" first  
commercial u.h.f. station

By VICTOR BARY\*

**T**HE FCC's announcement last April of the v.h.f.-u.h.f. allocations plan for new television stations ended the work of various experimental u.h.f. television stations throughout the country.

One of these, RCA-NBC station KC2XAK in Stratford (near Bridgeport), Connecticut (RADIO-ELECTRONICS, August, 1950), played a major part in speeding up the "thaw" by broadcasting continuously for two years and eight months according to strict commercial standards, and by making its facilities and test data available to the entire TV industry and to the public. During the 32 months of its career, KC2XAK broadcast u.h.f. TV programs 14 hours a day, 5 days a week, and served as the experimental guinea pig for the TV industry.

Aside from its routine program operations this pioneer station furnished answers to vital problems of tube and component performance at u.h.f., circuit stability data, and transmitting-antenna design information. It also helped TV-receiver manufacturers design and field-test u.h.f. receivers, antennas, and converters, and aided test-equipment manufacturers in designing and testing frequency- and modulation-monitoring equipment for future commercial service. The final sign-off took place on August 23. Bill McAlister and myself, who had started with KC2XAK as the two-man operational staff and had lived with it through its more than two-and-a-half years' existence, were assigned to go along with the station and get it going again in its new home.

Just 26 days later, on September 18, 1952, the KC2XAK transmitter came on the air again as a television station in Portland, Oregon. Under new call letters, it then became the world's first commercial u.h.f. TV station two days afterward when it signed on the air officially as KPTV, channel 27, ending the television famine for a city of over half a million people. In transmitting a test pattern exactly 10 days after the first piece of electronic equipment was moved into the still-uncompleted transmitter building, KPTV not only surprised the broadcast industry, but

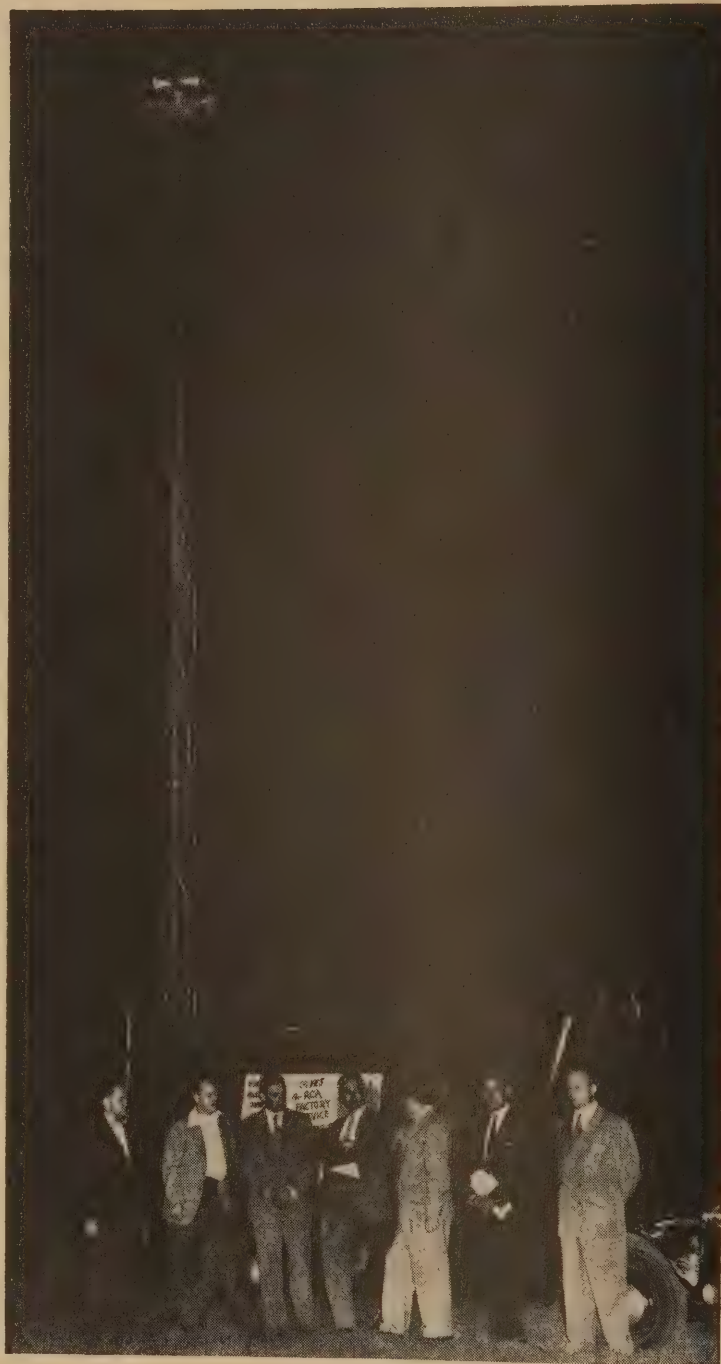
set off the frantic rush of receiver sales and installations which will keep Portland's radio and TV technicians red-eyed and sleepless for many a month.

Operation on TV channel 27, 548-554 mc, instead of the original 529-535 mc meant that a new antenna and filter-plexer had to be built, the transmitter retuned, and a new control crystal ground. In a brief 26 days we tagged,

This survey crew checked KPTV's first broadcast. The corner-reflector antenna can be raised 70 feet above the street.

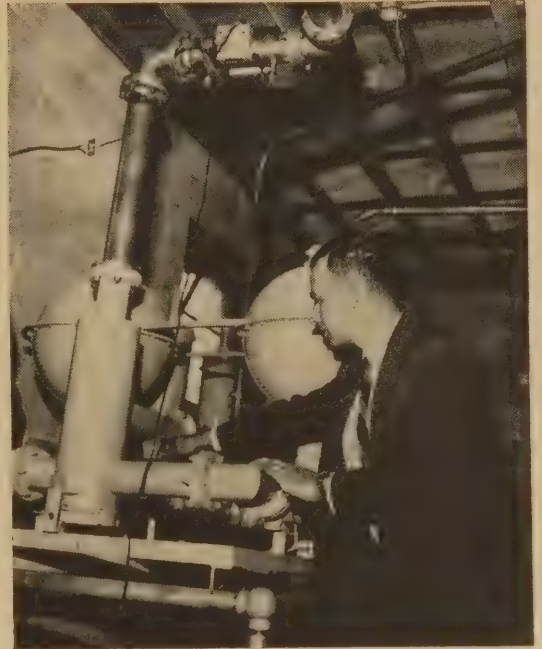
dismantled, and packed the complete transmitter and tower, anxiously followed their progress on the 3,000-mile haul from the East to the West Coast, and reassembled it at its new location.

After the transmitter was retuned to the new frequency at Bridgeport, it was broken down into paired frames and racks; heavy or fragile components were removed, packed, and crated in-



\* Engineer, National Broadcasting Co.





Right—Victor Bary checks KPTV's "filterplexer," which feeds sound and video signals to a single transmitting antenna. Above—KPTV's chief station engineer Russ Olsen (seated) and Bill McAlister of NBC.

dividually, and loaded immediately aboard a transcontinental motor van. The tower and antenna were disassembled, marked, and loaded aboard a fast-freight railroad car—the tower destined for Portland, and the antenna to be returned to RCA in Camden, New Jersey, as it was unsuitable for operation at the higher frequency. The transmitter reached Portland September 8, and the tower and new antenna arrived three days later.

We went to work immediately, keeping the same floor plan and general layout used in Bridgeport. In this way, we were able to use the original interconnecting cables, so that work proceeded rapidly. An Indian-head monoscope and synchronization generator were added to the original video equipment, along with additional amplifiers for the temporary studio. When the 60-kva service line was finally brought in five days later we were able to fire up and deliver full power to the dummy load the same day.

Meanwhile, the tower had been erected, the 3½-inch transmission line installed, and the new transmitting antenna checked. KPTV's owner was kept informed of our daily progress, and made immediate application for temporary authorization to broadcast. Work went on without interruption and in the next five days, a film camera chain was set up and checked, and a sound-isolated studio was constructed—complete with video- and audio-monitoring equipment and program lines. Construction work on the building itself was still going on, and we were forced to compete for work space with bricklayers, carpenters, plumbers, and electricians. The complex co-ordinated effort—including authorization from the FCC, and the Portland City Commission, and planning, manufacturing, and construction by RCA, NBC, and the Empire Coil Company—culminated in the station's official sign-on on September 20. KPTV's ground-breaking ceremony in August had set off a flood of local rumors and speculation as to the opening day. Daily construction progress was reported in print and picture.

Needless to say, KPTV's early arrival

surprised even the most optimistic prognosticator: Portland was able to see its first televised World Series.

A rapid, but extensive reception survey was undertaken by RCA as soon as the channel 27 test pattern hit the air, and the coverage proved immensely gratifying, with good clear pictures being received 25 to 30 miles away. Usable-picture reports also came from Salem (45 miles away) and other localities, with one report of good reception (the furthestmost one at that time) at 90 miles distance.

Dominating the city from a height of over 1,000 feet, the 17-kilowatt effective radiated power developed from the basic 1-kilowatt transmitter output by the RCA TFU-24 antenna, is beamed downward over a service area which is topographically a virtual plain, an ideal situation for good u.h.f. reception. Terrain and foliage-shadow problems, though minimized by the exceptional transmitting height, were nevertheless present and accounted for poor pictures in some areas. A rough estimate based on this early survey showed 10% of the locations checked were getting poor signals or none at all. Many of these locations, behind high hills, tall buildings, or shadowed by high trees, were able later to get acceptable pictures with higher-gain antennas, with elevated antennas, or by reorienting so that they worked from a strong reflection; and by using more sensitive u.h.f. converters. From the installer's viewpoint, each of these cases was a "special," as the time required to search for a signal, and substitute higher-efficiency components meant losing valuable time at a period when the technician could least afford it.

Performance reports on various makes of converters and antennas showed that good results were obtained with both built-in (turret-strip) and external converters; with dipole anten-

nas (single and stacked "bow-ties"); as well as with Yagis, corner reflectors, parabolas, and vees. Performance of dual-purpose antennas could not be evaluated fairly as no v.h.f. signal was available but the dual's performance on u.h.f. did not always match the ones designed strictly for u.h.f. reception. Three days after KPTV's test signals appeared on the air, not a turnbuckle, stand-off insulator, spool of lead-in or guy wire or other equipment needed for antenna installation could be bought from local suppliers. Receivers and converters were arriving hourly by truck, railroad, and air freight. These were rushed immediately to hastily-set-up test points in warehouses, where they were checked over by crews working round-the-clock. The larger service organizations imported experienced crew chiefs to train and instruct local teams in the techniques of handling u.h.f. TV, and to assist independent service technicians in getting started.

Two days after the first test pattern transmission, KPTV signed on officially, with a program originating in the temporary studio in the transmitter building. The opening program included an address by Herbert Mayer, head of KPTV and the Empire Coil Co.; a documentary film on the history of u.h.f. TV; the NBC network's All-Star Review, and the Show of Shows. Later, the 1952 World Series played to standing-room-only audiences in automobile showrooms, furniture stores, and appliance stores throughout town.

After a hectic three weeks I left KC2XAK-KPTV and Portland to return East. Bill McAlister stayed on to help put on the finishing touches, wrap up loose ends, and train a technical staff, as well as to help plan and construct KPTV's proposed studios in the heart of the city.

Television had come to Portland at last.

END



# KINESCOPE REPLACEMENT CHART

By E. W. SCOTT

This chart simplifies comparisons of the principal characteristics of most television picture tubes



Fig. 1



Fig. 2



Fig. 3



Fig. 4

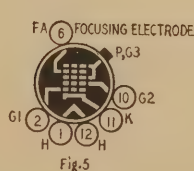


Fig. 5



Fig. 6



Fig. 7

Tube type	Bulb diameter or diagonal (inches)	Over-all length	Ion trap type	Base diagram Fig. No.	Anode connector	Notes
<b>10-inch glass round, 50 degrees</b>						
10BP4	10 1/2	17 5/8	Double	1	Cavity	
10EP4	10 1/2	17 5/8	Double	1	Ball	
10FP4	10 1/2	17 5/8	None	1	Cavity	
10MP4	10 1/2	17	Single	2	Cavity	
10CP4	10 1/2	16 5/8	None	1	Ball	
<b>10-inch glass round, 50 degrees, electrostatic focus</b>						
10DP4	10 1/2	17 5/8	None	5	Cavity	a
<b>12 1/2-inch glass round, 50 degrees</b>						
12BP4	12 9/16	17 7/8	Single	1	Cavity	p
12LP4	12 7/16	18 3/4	Double	1	Cavity	
12TP4	12 7/16	18 3/4	Double	1	Cavity	a
12VP4	12 7/16	18	Single	2	Cavity	
12WP4	12 7/16	17 3/4	Single	7	Special	
12KP4	12 7/16	17 5/8	None	1	Cavity	
12QP4	12 7/16	17 1/2	Single	1	Ball	
12JP4	12 3/16	17 1/2	None	1	Ball	d
12RP4	12 3/16	17 1/2	Single	1	Ball	d
12CP4	12 1/16	18 5/8	None	3	Cavity	a, b, c
<b>12 1/2-inch glass round, 40 degrees, electrostatic focus</b>						
12AP4	12 3/16	25 3/8	None	4	Cap	a, c
<b>12 1/2-inch metal round, 54 degrees</b>						
12UP4	12 7/16	18 5/8	Double	1	Cone	a
<b>14-inch glass rectangular, 70 degrees</b>						
14BP4	13 11/16	16 13/16	Double	1	Cavity	
14EP4	13 11/16	16 13/16	Double	1	Cavity	
14CP4	13 11/16	16 3/4	Single	1	Cavity	
14DP4	13 11/16	16 3/4	Double	1	Cavity	
<b>14-inch glass rectangular, 70 degrees, h.v. electrostatic focus</b>						
14GP4	12 21/32	17 3/16	Single	5	Cavity	
<b>15-inch glass round, 50 degrees</b>						
15CP4	15 3/4	21 7/8	Double	1	Cavity	a
<b>15-inch glass round, 57 degrees</b>						
15AP4	15 3/4	20 7/8	None	1	Ball	a
15DP4	15 3/4	20 7/8	Single	1	Ball	a
15BP4	15 3/4	20 7/8	Single	1	Cavity	k
<b>16-inch glass round, 50-60 degrees</b>						
16MP4	16 1/8	21 3/4	Double	1	Cavity	
16FP4	16 1/8	21 1/4	Single	1	Ball	a
16JP4	16 1/8	20 3/4	Double	1	Cavity	
16LP4	15 7/8	22 1/4	Double	1	Cavity	f, g
16CP4	15 7/8	21 1/2	Double	1	Cavity	a, f, g
16HP4	15 7/8	21 1/4	Double	1	Cavity	f
16DP4	15 7/8	20 3/4	Double	1	Cavity	a
<b>16-inch glass rectangular, 70 degrees</b>						
16UP4	17 1/8	18 1/8	Single	1	Cavity	a
16TP4	16 5/16	18 1/8	Single	1	Cavity	
16QP4	16 1/8	19 1/8	Double	1	Cavity	a, e
16KP4	16 1/8	18 3/4	Single	1	Cavity	
16RP4	16 1/8	18 3/4	Single	1	Cavity	
16XP4	16 1/8	18 3/4	Double	1	Cavity	a
<b>16-inch glass round, 70 degrees</b>						
16ZP4	15 7/8	22 1/4	Double	1	Cavity	h
16WP4	15 7/8	17 3/4	Double	1	Cavity	a, h
16SP4	15 7/8	17 5/16	Single	1	Cavity	h
16YP4	15 7/8	17 5/16	Single	1	Cavity	h
16VP4	15 7/8	17 3/16	Single	1	Cavity	a
<b>16-inch metal round, 53 degrees</b>						
16AP4	15 7/8	22 5/16	Double	1	Cone	a
<b>16-inch metal round, 60 degrees</b>						
16EP4	15 7/8	19 5/8	Double	1	Cone	a
<b>16-inch metal round, 70 degrees</b>						
16GP4	15 7/8	17 11/16	Single	1	Cone	a, i
<b>16-inch glass round, 60 degrees, self focus</b>						
16ACP4	15 7/8	20 7/8	Single	6	Cavity	



Tube type	Bulb diameter or diagonal (inches)	Over-all length	Ion trap type	Base diagram Fig. No.	Anode connector	Notes
<b>17-inch glass rectangular, 70 degrees</b>						
17BP4	16 3/4	19 5/8	Single	1	Cavity	
17AP4	16 3/4	18 5/8	Single	1	Cavity	
17JP4	16 3/4	19 9/16	Single	1	Cavity	
17QP4	16 3/4	19 9/16	Single	1	Cavity	m
17UP4	16 3/4	19 9/16	Single	1	Cavity	m
17YP4	16 3/4	19 9/16	Single	1	Cavity	m
<b>17-inch glass rectangular, 70 degrees, electrostatic focus</b>						
17FP4	16 3/4	19 5/8	Single	5	Cavity	s
17HP4	16 3/4	19 9/16	Single	5	Cavity	r
17LP4	16 3/4	19 9/16	Single	5	Cavity	m, r
17RP4	16 3/4	19 3/4	Single	5	Cavity	r
17VP4	16 3/4	19 9/16	Single	5	Cavity	m, r
17KP4	16 3/4	19 5/8	Single	6	Cavity	t
17SP4	16 5/8	19 3/16	Single	6	Cavity	m, t
<b>17-inch metal rectangular, 70 degrees</b>						
17CP4	17	19	Single	1	Cone	a
<b>17-inch metal rectangular, 70 degrees electrostatic focus</b>						
17GP4	17	18 1/16	Single	5	Cone	a, s
17TP4	16 13/16	19 5/16	Single	5	Cone	a, r
<b>19-inch glass round, 66 degrees</b>						
19FP4	18 7/8	22	Double	1	Cavity	a
19DP4	18 7/8	21 1/2	Double	1	Cavity	e
19GP4	18 7/8	21 1/4	Single	1	Cavity	a
<b>19-inch metal round, 66 degrees</b>						
19AP4	18 3/4	22	Single	1	Cone	a
<b>19-inch glass rectangular, 70 degrees</b>						
19JP4	18 5/8	21 3/16	Single	1	Cavity	a
19EP4	17 1/8	21 1/2	Double	1	Cavity	
<b>20-inch glass round, 54 degrees</b>						
20BP4	20 3/8	28 3/4	None	1	Cap	a
<b>20-inch glass rectangular, 70 degrees</b>						
20DP4	20 3/32	21 7/8	Single	1	Cavity	
20CP4	20 7/32	21 13/16	Single	1	Cavity	a, n
<b>20-inch glass rectangular, 70 degrees, electrostatic focus</b>						
20MP4	20 9/32	22 1/8	Single	5	Cavity	r
20HP4	20 7/32	22 1/8	Single	5	Cavity	a, n, r
20LP4	20 7/32	22 1/8	Single	5	Cavity	r
20FP4	20 3/32	22 1/8	Single	5	Cavity	a, n, s
20GP4	20 3/32	22 1/8	Single	5	Cavity	s
<b>20-inch glass rectangular, 70 degrees, self-focus</b>						
20JP4	20 7/32	22 1/8	Single	6	Cavity	
<b>21-inch metal rectangular, 70 degrees</b>						
21DP4	22 5/8	21	Single	5	Cone	a, s
21GP4	22 5/8	21	Single	6	Cone	a, t
21AP4	20 3/4	22 5/8	Single	1	Cone	
21MP4	21	22 5/8	Single	5	Cone	a, r
<b>21-inch glass rectangular, 70 degrees</b>						
21FP4	21 11/32	23 3/8	Single	5	Cavity	m, r
21KP4	21 11/32	23 3/8	Single	6	Cavity	m, t
21EP4	21 11/32	23 3/8	Single	1	Cavity	o
21WP4	20 5/8	22 5/8	Single	1	Cavity	
21WP4X	20 5/8	22 1/8	Single	1	Cavity	q
<b>22-inch metal round, 70 degrees</b>						
22AP4	21 11/16	22 7/8	Single	1	Cone	a
<b>24-inch metal round, 70 degrees</b>						
24AP4	24 1/8	24 7/16	Single	1	Cone	a
<b>24-inch metal round, 70 degrees, i.v. electrostatic focus</b>						
24BP4	24 1/8	24 7/16	Single	5	Cone	a
<b>27-inch metal rectangular, 90 degrees</b>						
27AP4	26 7/8	21 7/8	Single	1	Cone	
<b>27-inch glass rectangular, 90 degrees</b>						
27EP4	27	23 3/32	Single	1	Cavity	
<b>30-inch metal round, 90 degrees</b>						
30BP4	30 1/8	23 9/16	Single	1	Cone	a

The modern TV service technician has found that many of the big-screen picture tubes of a few years ago are either practically extinct or—like the 20AP4—now cost several times as much as newer tube types of equal size or larger. Converting the set to use one of the new tube types is often the most practical and economical solution to the problem.

At this point, the technician has the problem of selecting the most suitable replacement tube. The logical solution is to select a tube which can be installed with the fewest possible changes in the circuit and the receiver cabinet. This tabulation of magnetic-deflection tubes has been prepared to help the technician select the logical tube for any conversion or replacement.

Tubes are listed according to size, shape, diagonal deflection angle, and method of focusing. Types with angles of 50 to 60 degrees can usually be interchanged without modifying the receiver circuits. The flyback transformer and yoke should be replaced when the replacement tube is a round type with a 66- to 70-degree deflection angle or a rectangular type having a 70-degree diagonal deflection angle.

Sweep and operating voltages to give adequate picture size and brightness with the new tube can be obtained by selecting suitable horizontal-output and deflection components, and applying conversion techniques described in the many conversion articles which have been published in RADIO-ELECTRONICS. A complete tabulation of yokes, horizontal-output and flyback transformers, and other conversion components is included on page 66 of this issue.

**Note:** Recently-made RCA 10BP4, 12LP4, and 16AP4 tubes have a new type gun. Although they operate satisfactorily with double-field beam-benders used with earlier types they are designed to work with single field beam-bender. If trouble develops, substitute a single-field PM type ion-trap magnet designed for the 16GP4.

#### FOOTNOTES

- a—Tube has no exterior conductive coating. Add 500-μmf, high-voltage filter capacitor when using tube as replacement for type having exterior coating. When this type is replaced by tube having outside coating, ground the coating to the chassis.
- b—Triode type tube; has no No. 2 grid. For circuitry, refer to diagrams of sets using triode and tetrode types. Alter receiver circuits where necessary to suit tube being used for replacement.
- c—This tube has 2.5-volt, 2.1-amp heater; all others have 6.3-volt, 600-ma heaters.
- d—Faceplate curvature has 20-inch radius; all others in this group have 40-inch radius.
- e—Requires JETEC-RTMA type 106 focus coil; others in this group use type 109 focus coil.
- f—Faceplate curvature has 56-inch radius; others in this group have 27-inch radius.
- g—Deflection angle is 50 degrees. The deflection angle for other tubes in this group is 60 degrees.
- h—Radius of faceplate curvature is 56 inches.
- i—Radius of faceplate curvature is 40 inches; all others in this group have 27-inch radius.
- j—17BP4-A and B have outside conductive coatings; 17BP4 has not.
- k—Identical to 15DP4 except it has gray faceplate and cavity type anode contact.
- m—Cylindrical face.
- n—Tube with suffix "A" has external conductive coating.
- o—Tube with suffix "A" has cylindrical face.
- p—Identical to 12QP4 except that anode contact is recessed-cavity type.
- q—Experimental type—first run.
- r—Tube has low-voltage electrostatic focus electrode.
- s—Tube has high-voltage electrostatic focus electrode.
- t—Self-focus tube.

END



# TELEVISION COMPONENTS

**T**HE SUCCESS of any TV conversion or repair job in terms of customer satisfaction depends on high-quality materials and high-grade workmanship. From the technician's viewpoint, there's also the question of profit. The technician has the ability and equipment to do the job profitably, so he needs only to supply high-quality, long-lasting components to win and hold a satisfied customer. This tabulation will enable him to select the desired components for any job quickly and accurately.

Before beginning any service job that requires the replacement of the horizontal output transformer or deflection yoke, it is advisable—whenever possible—to check the tubes and all operating voltages to insure that the balance of the set is working with maximum efficiency. Do not operate a television receiver with the deflection yoke disconnected or the plate cap removed from the horizontal output tube. The first is likely to cause damage to the focus control potentiometer and the latter will quickly damage the output tube.

After installing the new components, carefully readjust the horizontal frequency and drive controls and the setting of the ion trap in accord with the set manufacturers' service instructions. Failure to do this may result in abnormal or subnormal sweep, high and boosted B plus voltages, and a damaged picture tube.

When yoke and output transformer are to be replaced, manufacturers' matched sets are desirable whenever possible. When using unmatched units, try connecting the width coil and deflection yoke across the various taps on the secondary of the transformer to determine which gives the best performance.

Corona and arc-over often occur after a new high-voltage transformer has been installed. Higher operating voltages, changes in lead dress, grime-encrusted insulation materials, and poor placement of parts often combine to cause these troubles.

Corona which occurs from a high-voltage point close to the chassis, high-voltage cage, or other grounded body will often cause a shiny spot to appear on the grounded body directly opposite the spot where corona occurs. A pitted or burned spot will be seen at the point of an arc. These troubles can be eliminated by rounding off all sharp edges and by increasing separation between ground and the high-voltage component. One quick method of eliminating these troubles is to coat the high-voltage point with anti-corona dope or lacquer and use a large ball-peen hammer to make a concave dimple in the cage cover directly opposite the point where the corona or arc occurred.

## HORIZONTAL OUTPUT AND H.V. TRANSFORMERS

Mfr. and Type No.	Max. kv	Defl. Angle (deg.)	Core	Typical Output Tubes	H.V. Rect. Tubes	Mfr.'s Matching Yoke	Equiv. G-E-RCA Transformer
DUMONT H1A1	13	70	Ferrite	6BG6-G 6BQ6-GT	1B3-GT 1X2	Y2A1 Y2A2	77J1
G-E 77J7	15	70	Ferrite	6AV5-GT 6BQ6-GT 6AU5-GT 6BG6-G	1X2-A		
HALL FB400 HALL FB401	10 14	50-57 70	Pow. iron Ferrite	6BG6-G 6BG6-G 6BQ6-GT	1B3-GT 1B3-GT 1X2-A	DF600 DF601 DF602	211T3 77J1
HALL FB402 HALL FB403 HALL FB404	13.5 13 14	50-57 70 70	Pow. iron Pow. iron Air	6BG6-G 6BG6-G 6BG6-G	1B3-GT 1B3-GT 1B3-GT	DF600 DF601 DF603	211T5 74951
HALL FB405 <sup>23</sup>	15	70	Ferrite	6CD6-G	1X2-A 1B3-GT	DF601	79C30-2, -4 79038-1 <sup>24</sup> 79C30-1, -3 <sup>24</sup>
HALL FB406 <sup>23</sup>	15	70	Ferrite	6CD6-G	1X2-A 1B3-GT 1X2-A	DF601	
MERIT HVO-5	14	70	Ferrite	6BG6-G 6CD6-G 6BQ6-GT	1B3-GT or 1X2-A for all types	MD-12	211T5
MERIT HVO-6	14	70	Ferrite	6BG6-G 6CD6-G 6BQ6-GT 6AU5-GT		MDF-70	77J1
MERIT HVO-7	14	70	Ferrite	6BG6-G 6CD6-G 6BQ6-GT 6AU5-GT		MDF-70	
MERIT HVO-8	14	70	Ferrite	6AV5-GT 6BG6-G 6CD6-G		MDF-30	
MERIT HVO-9	13	70	Ferrite	6BQ6-GT 6CD6-G 6BG6-G		MDF-70 MDF-71	
MERIT HVO-10	15	70	Ferrite	6BQ6-GT 6CD6-G 6BG6-G 6BQ6-GT 6AU5-GT 6AV5-GT		MDF-70	
RAM XO32 <sup>5</sup>	13		Ferrite	6BG6-G 6BQ6-GT 6AU5-GT for all types to and including XO47	1B3-GT or 1X2-A for all types	Y70F08	204T3
RAM XO35	14.5		Ferrite			Y70F08 Y70F10	
RAM XO45	14	70	Ferrite			Y70F14 Y70F17 Y70F30 Y70F08 Y70F10 Y70F14	RTO-068, -076, -090
RAM XO47 RAM XO49 <sup>25</sup>	12-14 13.5-15	70	Ferrite Ferrite	6BG6-G 6BQ6-GT 6AU5-GT 6CD6-G		Y70F08 Y70F10 Y70F14 Y70F17 Y70F30 Y70F08 Y70F10 Y70F30 Y70F30 Y70F30/3	
RAM XO50 <sup>28</sup>	14	70	Ferrite	Same as XO32		Y70F08 Y70F10 Y70F14 Y70F17 Y70F30 Y70F08 Y70F10 Y70F30 Y70F30/3	
RAM XO51 <sup>27</sup>	14	70	Ferrite	Same as XO32			
RAM XO53 <sup>8</sup>	15-16	70	Ferrite	6BQ6-GT			
RAM XO54 <sup>28 29</sup> RAM XO64 <sup>28 30</sup>	12-14 12-14	70 70		6BQ6-GT 6BQ6-GT			

## LINEARITY COILS

Mfr. and Type No.	RCA-G-E Equiv.	Inductance (mh)	Mfr. and Type No.	RCA-G-E Equiv.	Inductance (mh)
DUMONT L1A1			RCA 201R3		5.5-20.0
G-E RLD-016			RCA 201R5		0.55-2.3
MERIT MWC-1		0.3-27	RCA 207R1		1.3-4.3
MERIT MWC-2		0.1-4.0	RCA 209R1		1.3-4.1
MERIT MWC-3		20-60	RCA 213R1		1.5-8.3
RAM 201R3		5.0-20.0	STAN S-958	201R3	
RAM 201R5 <sup>22</sup>		0.55-2.3	STAN S-980	77J4	
RAM 201R10		3.5-29.5	TECH 1R3	201R3	
			TECH 1R5 <sup>22</sup>	201R5	
			TECH 9R1	209R1	



# FOR CONVERSION OR REPAIR

## HORIZONTAL OUTPUT AND H.V. TRANSFORMERS (continued)

Mfr. and Type No.	Max. kv	Defl. Angle (deg.)	Core	Typical Output Tubes	H.V. Rect. Tubes	Mfr.'s Matching Yoke	Equiv. 1G-E-RCA Transformer
RAM XO65 <sup>20</sup> 51 RAM XO66 <sup>20</sup> RAM XO68 <sup>20</sup> RAM XO69 <sup>20</sup> RAM XO70 RAM XO71 RAM XO72	14-15 14 11-13.5 16-17.5 13 15 15	70 70 70 70 70 70 70	Air Ferrite Ferrite Ferrite	6BQ6-GT Same as XO32 6BQ6-G 6AV5-GT Same as XO32 6CD6-G 6BQ5-GT		Y70F20 Y70F08 Y70F30/3 Y70F14 Y70F08 Y70F10 Y70F10	
RCA 211T1	9	50-57	Pow. iron	6BG6-G	1B3-GT	201D12 207D1 201D12	
RCA 211T3 RCA 223T1 RCA 224T1	8.75 14 14	50-57 70 66-70	Pow. iron Ferrite Ferrite	6BG6-G 6AU5-GT 6BQ6-GT	1B3-GT 1B3-GT 1B3-GT	209D1 209D1 211D2 209D1	
RCA 225T1	16	66-70	Ferrite	6BQ6-GT 6AU5GT 6CD5-G	1B3-GT	211D1 211D1 211D1 211D2	
RCA 230T1	18	66-70	Ferrite		1B3-GT	All	
RCA 231T1 <sup>13</sup> 53 RCA 232T1 <sup>13</sup> 53 53	15 16	50-70 50-70	Ferrite Ferrite	All types All types	1B3-GT 1V2, 1X2-A 1X2-A, 1V2, 1B3-GT	All	
ROOT SRJ1	14	70	Ferrite	6BG6-G 6BQ6-GT 6CD5-G (2) 6BQ6-GT	1B3-GT 1X2 (2) 1B3-GT		77J1
ROOT SR-25 <sup>53</sup>	21	90					
STAN S-948 STAN S-968 STAN S-978 STAN S-988 STAN S-999	9 12 13.5 14.3 14.5	50-57 50-57 50-57 50-57 70	Pow. iron Pow. iron Pow. iron Pow. iron Ferrite	6BG6-G 6BG6-G 6BG6-G 6BG6-G 6BQ6-GT	1B3-GT 1B3-GT 1B3-GT (2) 1B3-GT 1X2		211T1 211T3 211T5 211T5 77J1
STAND A-8119 STAND A-8127 STAND A-8128 STAND A-8129 STAND A-8130 STAND A-8131 STAND A-8133 <sup>17</sup>	13 10 11 13 14 13 12.5-15	53 53 53 70 70 70 70	Pow. iron Pow. iron Pow. iron Ferrite Ferrite Air Ferrite	6BG6-G 6BG6-G 6BG6-G 6BG6-G 6BG6-G 6BG6-G	(2) 1B3-GT 1B3-GT 1B3-GT 1B3-GT 1B3-GT	DY-1 DY-1 DY-1 DY-7 DY-7	211T5 211T3 74951
TECH 15T1 TECH 11T5 TECH 23T1 TECH 7J1	10 13.5 14 15	53 60 70 70	Ferrite Ferrite Ferrite Ferrite	6BG6-G 6AU5-GT Most types	1B3-GT 1B3-GT 1X2-A		215T1 211T5 223T1 77J1
TODD CS21 TODD CS24 TODD CS24-AGC TODD CS21-AGC TODD CS-U <sup>53</sup> TODD CS-30	15 15 16 16 10-14 23	50-70 70 70 70 50-70 70-90	Ferrite Ferrite Ferrite Ferrite Ferrite Ferrite				
TRIAD D-1	14	70	Ferrite	6BG6-G 6BQ6-GT 6BG6-G	1X2-A 1B3-GT 1B3-GT		77J1
TRIAD D-2	14	70	Ferrite		1X2-A 1X3	Y-11	
TRIAD D-11	10	70	Iron	6BG6-G 6BQ6-GT 6BG6-G			
TRIAD D-14	14	70	Ferrite	6BG6-G 6BQ6-GT 6BG6-G	1B3-GT	Y-12 Y-17 Y-12	77J1
TRIAD D-15 <sup>1</sup>	14	70	Ferrite	6BG6-G 6BQ6-GT AUS-GT 6BQ5-GT AUS GT	1B3-GT	Y-17 Y-19 Y-20	225T1
TRIAD D-19 <sup>6</sup>	16	70	Ferrite				
TRIAD DA-20	14	70	Air	6BQ5-GT	1B3-GT		74951

## FOCUS DEVICES

Mfr. and Type No.	JETEC-RTMA Equiv.	C-R Tube High Volts (kv)	D.c. Res. (ohms)	Current (ma)	Mfr. and Type No.	JETEC-RTMA Equiv.	C-R Tube High Volts (kv)	D.c. Res. (ohms)	Current (ma)
G-E RLF-038			1,400	30	RCA 202D2	109	9-14	470	75-140
HALL EM700 HALL EM 701	106 109	to 10 to 16	247 470	75-200 75-140	STAND FC-10 STAND FC-11 STAND FC-12			247 470 370	200 140 165
MERIT MF-1 MERIT MF-2 MERIT MF-3 <sup>15</sup> MERIT MF-4 MERIT MF-5	106 109 109 109 109	10 14 14 15 15	247 470 360 1,000 1,500	200 150 150 75 75	TECH 2D1 TECH 2D2 TECH 2D1PM <sup>16</sup> 20 TECH 2D2PM <sup>16</sup> 21 37	106 109 106 109	10-12 12-16	247 470	115 95
QUAM QFL <sup>16</sup> QUAM QF2 <sup>16</sup>	106 109	to 12 above 12	Permanent Magnet Type		TRIAD B-160 TRIAD B-247 TRIAD B-470 TRIAD B-1000	23 24 25 25		160 247 470 1,000	210 170 125 85
RCA 202D1	106	8-12		247 75-200					

## WIDTH COILS

Mfr. and Type No.	No. Matching Horiz. Output Transformer	Inductance (mh)
DUMONT W1A1 <sup>39</sup>	H1A1	
G-E RLD-019	RTO-085	
MERIT MWC-1 <sup>14-39</sup>	HVO-6, -7 HVO-8, -9	
MERIT MWC-2 MERIT MWC-3	HVO-5, -9 HVO-8, -9	
RAM 201R1 RAM 201R4 RAM 201R10 RAM 201R11 <sup>39</sup>	XO32 XO35 XO45 XO32, XO35 XO53	.05-.25 0.17-0.61 3.5-29.5 (Pri.) 0.16-0.7 (Sec.) 3.2-9.0
RCA 201R1 RCA 201R2 RCA 201R4 RCA 206R1 RCA 211R1 RCA 212R1		.05-.25 85-240 0.17-0.61 0.47-1.7 1.65-9.2 2.9-16.0
STAN S-957 STAN S-981 <sup>39</sup> STAN S-984	S-998 S-999	.05-.25
STAND WC-5 <sup>1</sup>	All Stancor	4.0-39 A.g.c. winding 2.7-7.6
TECH 1R1 TECH 1R4 TECH 1R4-AG <sup>39</sup> TECH 1R4-J TECH 1R4-E <sup>39</sup>	11T1, 15T1 11T5 11T1, 11T5 TJ1 TJ1	

## ION TRAPS

Mfr. and Type No.	Single or Double	PM or EM	Field Strength (gauss)
CLAR TV-2 CLAR TV-3	Single Double	PM PM	
G-E RET-003 G-E RET-005	Single Single	PM PM	42 35
PERF IT135 PERF IT145-15	Single Double	PM PM	35 45 <sup>35</sup> 15 <sup>36</sup>
QUAM 1T1 QUAM 1T2 QUAM 1T3	Double Double Single	PM PM PM	38 46 42
RCA 203D1 RCA 203D3 <sup>34</sup>	Double Double	EM EM	55 <sup>35</sup> 15 <sup>36</sup>
TECH L1T1 TECH L1T2 TECH L1T3	Single Double Double	PM PM PM	35-45 45



## TV-TUBE MASKS

Mfr. & Type No.	Size Tube (inches)	Color	Material
CRON CK-14	14" rect.	Gold	Glass
CRON CK-16	16" rect.	Gold	Glass
CRON CK-17	17" rect.	Gold	Glass
CRON CK-20	20" rect.	Gold	Glass
CRON CK-21	21" rect.	Gold	Glass
JFD BR63-14	14" rect.		Plastic
JFD BR63-16	16" rect.		Plastic
JFD BR63-17	17" rect.		Plastic
JFD BR63-19	19" rect.		Plastic
JFD BR63-20	20" rect.		Plastic
JFD BR63-16R	16" round		Plastic
JFD BR63-19R	19" round		Plastic
TELE 712W	12½" round	Gold	Lucite
TELE 714R	14" rect.	Gold	Lucite
TELE 716R	16" rect.	Gold	Lucite
TELE 716W	16" round	Gold	Lucite
TELE 717R	17" rect.	Gold	Lucite
TELE 719W	19" round	Gold	Lucite
TELE 720R	20" rect.	Gold	Lucite
TELE 721R	21" rect.	Gold	Lucite
TELE 724W	24" round	Green	Lucite
TELE 227R	27" rect.	Green	Lucite

Note: Croname mask and escutcheon assemblies listed above consist of a heavy green-sprayed aluminum mask, ¼-inch tempered safety glass and a gold-finished escutcheon.

Tele Plastics masks listed above mount from rear of the cabinet. Masks which mount from the front of the cabinet have suffix "S." For example: 720W-S, and 727R-S.

## MOUNTING SLEEVES

Mfr. and Type No.	Tube Types
TECH PL-4	Long-neck 16" metal round
TECH PL-4S	Short-neck 16" metal round
TECH PL-17R	17" metal rectangular
TECH PL-19	19" metal round

Note: Set consists of polyethylene sleeve, retainer ring, and rubber band. Insulated for more than 30,000 volts.

## Footnotes for TV components tables:

- Has a.g.c. winding which can be left open if not required.
- Tapped secondary to match yokes from 8 to 30 mh and provide up to 15 kv output (16 kv with 232T1).
- For type 630 circuits.
- Damping resistors built-in. R-C network supplied.
- Complete with built-in R-C network.
- Especially for 19-inch round and 20-inch rectangular tubes.
- Designed for autotransformer type flyback transformer.
- Has focus-coil mounting bracket.
- Cosine yoke.
- Equivalent to 201D1.
- Same as 201D1 with different terminal connections.
- Same as 201D1 with molded core.
- Equivalent to 201D1, 203D3, and 201D12.
- Also used as horizontal linearity coil.
- For 10- or 12-inch tubes.
- PM focus magnets with adjustable centering controls.
- Any 70-degree yoke.
- Equivalent of 209D1, 206D1, and Y2A.
- Same as 211D1 except for damping networks.
- Any voltages suitable for 10- or 12-inch tubes.
- Any voltages suitable for any 70-degree tubes.
- Tapped linearity coil.
- Coil and terminal assembly only. Core pieces to be taken from transformer being replaced.
- Admiral part number.
- Has separate a.g.c. or width-coil winding.
- Has separate a.g.c. winding.
- Similar to XO45, but operates on lower voltage.
- Autotransformer.
- Used in CBS sets.
- Used in early Emerson sets.
- Used in late Emerson sets.
- Universal type.

## DEFLECTION YOKES

Mfr. & Type No.	Defl. Angle (deg.)	Max. Tube Size (inches)	Induct. Horiz. Winding (mh)	Induct. Vert. Winding (mh)	Core
DUMONT Y2A1 <sup>5</sup>	70	Any	10.5	42.0	Ferrite
DUMONT Y2A2	70	Any	10.5	42.0	Ferrite
DUMONT Y2A3 <sup>7</sup>	70	Any	10.5	42.0	Ferrite
DUMONT Y2A5 <sup>5 7</sup>	70	Any	10.5	42.0	Ferrite
G-E RLD-024 <sup>5 8</sup>	70	24	15.0	30.0	Ferrite
G-E RLD-025 <sup>5</sup>	70	24	15.0	30.0	Ferrite
HALL DF600	53	16	8.3	50.0	Iron
HALL DF601	70	24	8.5	50.0	Ferrite
HALL DF602	70	24	13.5	50.0	Ferrite
HALL DF603	70	24	30.0	3.5	Ferrite
HALL DF604	70	24	30.0	50.0	Ferrite
MERIT MD-12 <sup>13</sup>	53	16 round	8.3	50.0	
MERIT MD-13	53	16 round	30.0	50.0	
MERIT MDF-30 <sup>9 18</sup>	70	24	30.0	3.0	Ferrite
MERIT MDF-70 <sup>9 18</sup>	70	24	10.3	45.0	Ferrite
MERIT MDF-71 <sup>9</sup>	70	24	30.0	50.0	Ferrite
RAM Y70I08 <sup>5</sup>	70	16	8.3	50.0	Iron wire
RAM Y70F08 <sup>5</sup>	70	17	8.3	50.0	Ferrite
RAM Y70F10 <sup>5</sup>	70	24	10.3	50.0	Ferrite
RAM Y70F14 <sup>5</sup>	70	20	14.0	50.0	Ferrite
RAM Y70F17 <sup>5</sup>	70		17.0	50.0	Ferrite
RAM Y70F20 <sup>5</sup>	70		20.0	50.0	Ferrite
RAM Y70F30 <sup>5</sup>	70		30.0	50.0	Ferrite
RAM Y70F30/3 <sup>5</sup>	70	24	30.0	3.3	Ferrite
RCA 201D12 <sup>11</sup>	50-57	16	8.3	50.0	Iron wire
RCA 205D1 <sup>11</sup>	50-57	12	12.5	50.0	Molded iron
RCA 206D1	66-70	17	10.3	41.5	Ferrite
RCA 207D1 <sup>12</sup>	50-57	16	8.4	55.0	Molded iron
RCA 209D1	66-70	17	13.3	41.0	Ferrite
RCA 211D1 <sup>9</sup>	66-70	21	13.3	41.0	Ferrite
RCA 211D24 <sup>9 19</sup>	66-70	21	13.3	41.0	Ferrite
STAND DY-110 <sup>38</sup>	53		8.3	50.0	Molded iron
STAND DY-89 <sup>38</sup>	70		8.5	50.0	Ferrite
STAND DY-99 <sup>38</sup>	70		13.5	50.0	Ferrite
STAND DY-109 <sup>38</sup>	70		30.0	3.5	Ferrite
TECH 11D1	70	Any 70°	13.3	41.5	Ferrite
TODD CF303	70	24	30.0	3.0	Ferrite
TODD CF850	50-66	16	8.3	50.0	Ferrite
TODD CF1041	70	24	10.0	41.0	Ferrite
TODD CF1050	70	24	10.0	50.0	Ferrite
TODD CF1156	90	30	11.0	56.0	Ferrite
TODD CF1441	70	24	14.0	41.0	Ferrite
TODD CF1450	70	24	14.0	50.0	Ferrite
TODD CF1850	70	24	18.0	50.0	Ferrite
TODD CF2056	90	30	20.0	56.0	Ferrite
TODD CF3050	70	24	30.0	50.0	Ferrite
TRIAD Y-11 <sup>5</sup>	50	12	8.3	50.0	Iron
TRIAD Y-125 <sup>9</sup>	70	12	8.3	50.0	Ferrite
TRIAD Y-17 <sup>5 9</sup>	70	17	13.5	41.5	Ferrite
TRIAD Y-19 <sup>9</sup>	70	17	23.0	41.5	Ferrite
TRIAD Y-20 <sup>9</sup>	70	24	30.0	3.3	Ferrite

- Composite 90-degree deflection and high-voltage supply.
- Universal ion trap. May be used as single-field type by removing small ring-shaped magnet.
- Large magnet.
- Small magnet.
- For tubes up to 70 degrees.
- Available with or without leads and networks.
- Has a.g.c. winding.

## CODE MANUFACTURER

- CLAR—Clarostat Mfg. Co., Inc., Dover, N. H.  
 CRON—Croname, Inc., 3701 Ravenswood Ave., Chicago 13, Ill.  
 DU MONT—Allen B. Du Mont Laboratories, Inc., Electronic Parts Sales, 35 Market St., East Paterson, N. J.  
 G-E—General Electric Co., Receiver Parts Sales, Bldg. 5, Syracuse, N. Y.  
 HALL—The Hall-Johnson Co., 4500 Ravenswood Ave., Chicago 40, Ill.  
 JFD—JFD Mfg. Co., Inc., 6101-6123 16th Ave., Brooklyn 4, N. Y.

- MERIT—Merit Transformer Corp., 4427 N. Clark St., Chicago 40, Ill.  
 PERF—Perfection Electric Co., 2635 S. Wabash Ave., Chicago 16, Ill.  
 QUAM—Quam-Nichols Co., 33rd Place and Cottage Grove Ave., Chicago 16, Ill.  
 RAM—Ram Electronic Sales Co., South Buckhout St., Irvington-on-Hudson, N. Y.  
 RCA—Radio Corp. of America, Tube Dept., Harrison, N. J.  
 ROOT—Square Root Mfg. Corp., 391 Saw Mill River Rd., Yonkers, N. Y.  
 STAN—Stanwick Winding Co., Inc., P. O. Box 70, Newburgh, N. Y.  
 STAND—Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill.  
 TECH—Tech Master Products Co., 443 Broadway, New York, N. Y.  
 TELE—Tele Plastics Co., Division of Willmax Mfg. Co., 202 Broadway, Brooklyn 11, N. Y.  
 TODD—Todd-Tran Corp., 158 Gramatan Ave., Mt. Vernon, N. Y.  
 TRIAD—Triad Transformer Mfg. Co., 4055 Redwood Ave., Venice, Calif.



# TV SERVICE CLINIC

Conducted by  
**MATTHEW MANDL\***



Appearance of screen when cosine yoke is used without the corrector magnets.

**M**ANY queries regarding the features and installation factors of the Standard cascode tuner have been received by the Clinic. When old tuners are replaced with the cascode type a 2-1 improvement in gain can be realized. Besides this, there is a reduction of 35 to 50% in noise (snow effect) over a pentode tuner. These advantages are due to the cascode principle, plus use of the 6BQ7, 6BK7, or the newer 6BZ7 tubes. (A detailed discussion of the cascode type front end is given in RADIO-ELECTRONICS, April, 1952, page 46.)

The cascode tuner made by the Standard Coil Products Co. is model TV-2000, 2300 series and is designed to replace most of the older tuners of conventional size. The Standard tuner is  $4\frac{1}{2}$  inches deep and  $3\frac{1}{4}$  inches wide. Another model, the TV-2032, is electrically identical to the TV-2000 except that both the fine tuning and station selector shafts are extra long so that they may be cut as desired.

The tuner is for use with intercarrier or other receivers where sound take-off is not within the tuner circuit (at mixer output). For receivers requiring a 21.25-mc sound take-off coil, part No. XM-752 must be used, as shown in Fig. 1. This coil can be mounted on the chassis near the tuner. The capacitor designated  $C_T$  is not supplied with the tuner or coil and should be approximately 2 to 4  $\mu\text{f}$ . If greater audio output is required, the circuit shown in Fig. 2 can be used.

The output intermediate frequency is set at 22.3-mc at the factory, but the output is adjustable between 19 and 26 megacycles to suit the particular i.f. input system of the receiver. A screw set at an angle on top of coil L9 permits changing the output frequency within the range provided. The tuner tracking is preset at the factory and no other adjustments are normally necessary. If required, the oscillator coils can be adjusted individually for the different channels by centering the fine tuning control and using a noninductive screwdriver through the

hole adjacent to the selector shaft.

In fringe areas best results are obtained by using the maximum plate voltage of 250. An a.g.c. (or manually controlled) bias of -0.8 to -1.1 volts applied to the white a.g.c. lead gives best sensitivity. The black lead goes to the 6.3-volt a.c. source for the heater, while the red lead requires 135 volts plus and the blue 250 volts.

For u.h.f. reception, individual channel strips are available. These can replace any unused channel plug-in coils at the v.h.f. frequencies (channels 2 to 13). A separate u.h.f. strip must be used for every u.h.f. channel desired. Once the oscillator and antenna coil strips have been inserted, the selector shaft is rotated to the u.h.f. channel strip's operating position.

If the fine tuning doesn't produce the best picture at the mid-point of its range, the u.h.f. oscillator slug can be adjusted as previously mentioned for the v.h.f. stations. The u.h.f. strips contain an r.f. preselector, a crystal mixer, and a crystal harmonic generator to convert the ultra-high frequency carrier to the receiver i.f.

## Conversion to 21 inches

*I would like to convert a 630 type receiver to a 21-inch tube. The receiver already uses a 16HP4 tube with a high-voltage doubling system. What wiring changes and tube types do you recommend? W. H., Astoria, L. I.*

The 16HP4 has a 60-degree deflection angle. This means the present horizontal output transformer and yoke will not give satisfactory results for the 21-inch tubes, which have 70 degrees of deflection. Thus, a wide-angle transformer and yoke are necessary.

You could use a 21EP4A, which is a rectangular tube with a cavity high-voltage contact, single-magnet ion trap, and a 70-degree deflection angle. This is the curved-face tube which minimizes room glare. If a cosine yoke (wide-focus) is used, corrector magnets will have to be installed (see a discussion of this in the June, 1952, issue of RADIO-ELECTRONICS, Television Service Clinic). Without the corrector magnets, pin-

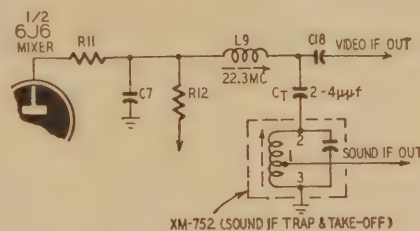


Fig. 1—How a sound take-off and trap can be installed in the cascode tuner.

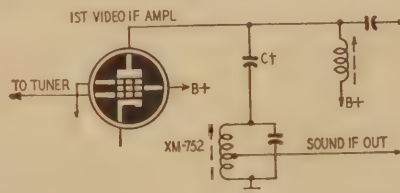


Fig. 2—Circuit for more sound output.

cushioning and nonlinearity will be difficult to correct. The photograph shows a test pattern on a 21EP4A tube without the use of corrector magnets. Despite the best adjustments of linearity controls, the inner circle shows defects in linearity.

A self-focus tube such as the 21KP4A tube can also be used. The existing focus-coil assembly must be removed from the tube neck because focus is correct when the ion trap is placed at maximum brilliancy. The focus coil can be replaced with a resistor of the same d.c. resistance value.

## 16GP4 to 17BP4

*What electrical changes would be necessary to change a receiver's 16GP4 to a 16RP4 or a 17BP4? E. C., New Orleans, La.*

As the 16GP4 is a 70-degree deflection tube, no changes should be necessary. If a 16RP4 is used, a double-magnet ion trap is necessary and the high voltage must be applied to the cavity contact receptacle of the glass tube. The 17BP4A has an external conductive coating and the 17BP4 does not. Both tubes use a single-magnet ion trap and a cavity-type high-voltage contact.

END



# TV BOOSTER

Manufacturer	Model	Band selection	Channel tuning	Tube(s)	Circuit	Installation	Other features
Alliance Manufacturing Co. Lake Park Blvd., Alliance, Ohio	Tenna-Scope AB	Sep. amps switching Automatic wide-band	Slug	2-6J6	T.p.t.g.	St.	Auto.
	Cascamatic BB		Slug	2-6J6 1-6BK7A	Cascode	St.	Auto.
Anchor Radio Corporation 2215 So. St. Louis Ave. Chicago 23, Ill.	ARC-101-75	All-channel switching	Slug	1-6AK5	T.p.t.g.	St.	Gain control
	ARC-101-100	All-channel switching	Slug	2-6AK5	2-stage	St.	Gain control
Approved Electronic Inst. Corp. 928 Broadway, New York 10, N. Y.	A-TVB	Chan. 12-13 U.h.f. V.h.f.	Untuned	2-6J6	2-stage	St.	A.c. operation A.c. operation
	A-UHF		Untuned	2-6AF4	2-stage	St.	
	B-VHF		Untuned	2-6AF4	2-stage	St.	
The Astatic Corporation Conneaut, Ohio	CT-1	Tuned ckts. switching	Slug	1-6BQ7 1-6J6	2-stage neut. p.p.	St.	Auto., by-pass switch, 72-or 300-ohm input and output
Blonder-Tongue Labs. Inc. 526-536 North Ave. Westfield, N. J.	HA-2	All-channel wide-band	Untuned	3-6J6	4-stage cascaded	St.	Auto. 24 db gain By-pass switch Auto. 16 db gain control switch 28 db gain control On-Off sw. Pilot light Plugs into B-T mixer-amplifier
	HA-3	All-channel wide-band	Untuned	1-12AV7 3-6J6	3-stage cascaded	St.	
	B-T Booster CA-1	All-channel wide-band	Untuned	2-6J6 2-6BQ7	4-stage cascaded	St.	
	Commercial Antensifier CS1-(channel No.) Channel Strip Amplifier	Single channel	Factory preset	1-6AB4 1-6CB6	2-stage cascaded	St. or Ant.	
David Bogen Co., Inc. 29 Ninth Ave. New York 14, N. Y.	BB1-A, BB1-B	Sep. amps switching Wide-band Wide-band	Slug	2-6J6	T.p.t.g.	St.	Auto.
	BIB-1 AMB-1			4-6J6 4-6J6	St. 4-stage St. 4-stage	St. Ant.	Auto. Control at set
Brach Manufacturing Corp. 200 Central Ave., Newark, N. J.	50825	Sep. amps wide-band	Slug adjust.	1-6AK5 1-6CB6	T.p.t.g.	St.	
	01630	Sep. amps wide-band	Untuned	3-6J6 1-12AU7	Cascade p.p.	St.	
Electro-Voice, Inc. Buchanan, Mich.	3000	Sep. amps wide-band	Untuned	4-6J6	2-stage broad-band	St.	Auto. 1- or 2-ant. input
	3002	Sep. amps wide-band	Untuned	2-6BK7	1-stage wide-band	St.	
	3010	Sep. amps wide-band	Untuned	4-6J6	2-stage broad-band	Ant.	Auto. 1- or 2-ant. input Auto. 1- or 2-ant. input
	3012	Sep. amps wide-band	Untuned	2-6BK7	1-stage wide-band	Ant.	
I.D.E.A. Inc. 7900 Pendleton Pike Indianapolis 26, Ind.	Regency DB-520	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	Pwr. outlet for revr.
Industrial Television, Inc. 369 Lexington Ave. Clifton, N. J.	IT-102A	All-channel broad-band	Untuned	2-6BK7	4-stage	Rear	18 db gain Auto.
	IT-90AB	All-channel sep. amps	Untuned	1-6AK5 1-6CB6 2-6BQ7, 1-6X4	3-stage cascode	Rear	Auto., sep. gain control for each band
	IT-96AB	Single channel	Fixed	1-6J6	2-stage	Rear	Auto.



# CHARACTERISTICS

Manufacturer	Model	Band selection	Channel tuning	Tube(s)	Circuit	Installation	Other features
J F D Manufacturing Co. 6101-23 Sixteenth Ave. Brooklyn 4, N. Y.	VB (chan. No.) <sup>1</sup>	Single channel	Factory preset	1-6J6	T.p.t.g.	Rear	
	SW (chan. No.)	Single channel	Factory preset	1-6J6	T.p.t.g.	Rear	Bypass switch
	EC4	All-channel broad-band	Untuned	2-6BQ7	2-stage	Rear	4 outputs
The La Pointe-Plascomold Corp. Rockville, Conn.	Vee-D-X	Single channel	Slug Adjust.	1-6J6	T.p.t.g.	Rear	Auto.
	Outboard Vee-D-X Rocket	Single channel	Slug Adjust.	1-6J6	T.p.t.g.	Ant.	Auto.
Mark Simpson Mfg. Co., Inc. 32-28 49th St., Long Island City 3, N. Y.	Sky Chief	All-channel switching	Slug	2-6J6	T.p.t.g.	St.	
	Super Sky Chief	All-channel switching	Slug	4-6J6	T.p.t.g.	St.	2 separately tuned sections
National Co., Inc. 61 Sherman St., Malden, Mass.	TVB-2BX	All-channel turret	Capacitor	1-6AK5	T.p.t.g.	St.	Separate output tuning control
The Radiart Corporation 3455 Vega Ave., Cleveland 13, Ohio	TVB-1	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	
Radio Merchandise Sales, Inc. 2016 Bronxdale Ave. New York 60, N. Y.	SP-6	All-channel switching	Slug	1-6AK5	T.p.t.g.	St.	Gain control
	SP-6J	All-channel switching	Slug	1-6J6	T.p.t.g. (neut.)	St.	
Regency—See I.D.E.A.							
Sutton Electric Co. 426 West Short St. Lexington, Ky.	16B	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	
	5A	Single channel	Fixed	1-6J6	T.p.t.g.	Ant.	Auto., sep. power lead
	SEC	Booster-converter	Slug	1-6AF4 1-6J6	T.p.t.g.	St.	All v.h.f. and u.h.f. channels
Tech-Master Products Company, 443-445 Broadway, N. Y. 13, N. Y.	TVB	All-channel switching	Capacitor	1-6AK5	Tuned plate	St.	Kit form
Technical Appliance Co. Sherburne, N. Y.	Taco 1628	Single channel	Factory preset	1-6AK5	T.p.t.g.	Ant.	Auto.
The Turner Company Cedar Rapids, Iowa	TV-2	Continuous 54-216 mc	Induc-tuner	1-12AT7	Cascode	St.	Auto.
Videon Electronic Corp. 222 East Ohio St. Indianapolis 4, Ind.	B-132	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	A.c. outlet for TV
	B-133	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	
	B-222	All-channel switching	Slug	1-6J6	T.p.t.g.	St.	

## TERMS AND ABBREVIATIONS

Wide-band—Operating over one or both v.h.f. bands without tuning.  
Switching—Using separate amplifiers for each band.  
All-channel—Refers to v.h.f. channels only; a booster which tunes channels 2-13.  
T.p.t.g.—Tuned-plate tuned-grid.

S-t 4-stage—Stagger-tuned 4-stage amplifier.  
St.—Standard mounting. (In separate cabinet)  
Rear—Mounted at rear of set. Does not need tuning for each station.  
Ant.—Antenna mounting.  
Auto—Turns on and off automatically with the

receiver.  
All other terms are self-explanatory.  
<sup>1</sup>These are made for all v.h.f. TV channels. In addition, there are two 2-channel models, one for channels 4 and 5, the other for channels 7 and 9.

END



# Directory of TV Receiver Characteristics

Manufacturer	Model	Chassis Number	AM-FM-SW	C-R Tube Type, or Size (In)	C-R Tube Anode KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I.F. Stages	Video I. F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks
Admiral Corp. 3800 Cortland St. Chicago 47, Ill.	17DX10, 17DX11, 17DX12	19B1	No	17BP4A	15	19	Yes	Ord	3	25.75	Strip	5 EM	Tur, C	No
	121DX11	19F1A	No	21WP4X	15	19	Yes	Ord	3	25.75	Strip	5 EM	Tur, C	No
	121DX123, 121DX163, 221DX15,													
	221DX16, 221DX17, 221DX26,													
	221DX38	19C1	No	20DP4A	15	19	Yes	Ord	3	25.75	Strip	10 EM	Tur, C	No
	222DX15	19H1	No	21WP4X	15	19	Yes	Ord	3	25.75	Strip	10 PM	Tur, C	No
	222DX15S, 222DX16, 222DX17,													
	222DX26, 222DX27, 222DX48,													
	222DX49	22C2	No	21EP4A	14.5	22	Yes	Key	3	25.75	Strip	10 PM	Tur, C	No
	228DX16, 228DX17	23A1	No	27EP4	17	23	Yes	Key	3	25.75	Strip	(2)10PM	Tur, C	No
Andrea Radio Corp. 27-01 Bridge Plaza North Long Island City 1, N. Y.	321DX26, 321DX26A, 321DX27A	19E1	AM13	20DP4A	15	21	Yes	Ord	3	25.75	Strip	6 PM	Tur, C	3 Pl
	321DX15, 321DX16, 321DX17	19E1	AM13	20DP4A	15	21	Yes	Ord	3	25.75	Strip	12 PM	Tur, C	3 Pl
	322DX16	22E2	AM13	21EP4A	14.5	24	Yes	Key	3	25.75	Strip	12 PM	Tur, C	3 Pl
	Brewster C-VL-17	VL17	FM	17CP4	13.5	24	No	Key	4	26.2	Ex Conv	12	Con	No
	Caronia CO-VL-19	VL19	AM-FM	19AP4	13.5	29	No	Key	4	26.2	Ex Conv	12	Con	Ph
	Fleetwood CO-VL-16	VL16	FM	16GP4	13.5	26	No	Key	4	26.2	Ex Conv	12	Con	No
	Gotham T-VL-17	VL17	FM	17CP4	13.5	24	No	Key	4	26.2	Ex Conv	7 1/2	Con	No
	Sutton C-VL-16	VL16	FM	16GP4	13.5	26	No	Key	4	26.2	Ex Conv	12	Con	No
Arvin Industries, Inc. Columbus, Ind.	6173TM	TE331	No	17LP4	15	22	Yes	Ord	4	45.75	Ex Conv	5	Sw, C	No
	6178TM-UHF	TE332	No	17LP4	15	24	Yes	Ord	4	45.75	Int Tune	5	Sw, C(VHF) Con (UHF)	No
	6213TM	TE319	No	21MP4	15	22	Yes	Ord	4	45.75	Ex Conv	6	Sw, C	No
	6213TM, TB-UHF	TE330	No	21MP4	15	24	Yes	Ord	4	45.75	Int Tune	6	Sw, C(VHF) Con (UHF)	No
	6215CM, CB	TE319	No	21MP4	15	22	Yes	Ord	4	45.75	Ex Conv	10	Sw, C	No
	6215CM, CB-UHF	TE330	No	21MP4	15	24	Yes	Ord	4	45.75	Int Tune	10	Sw, C(VHF) Con (UHF)	No
	7210CM, CB; 7212CFP;													
	7212MEA; 7214CM; 7216CB;													
	7218CM, CB; 7219CM	TE337	No	21MP4	15	26	Yes	Key	4	45.75	Ex Conv	10	Sw, C	PJ
	7210CM, CB-UHF; 7212CFP-UHF;													
	7212MEA-UHF; 7214CM-UHF;													
	7216CB-UHF; 7218CM, CB-UHF;	TE341	No	21MP4	15	28	Yes	Key	4	45.75	Int Tune	10	Sw, C(VHF) Con (UHF)	PJ
	7219CM-UHF													
	7276CB-UHF; 7279CM-UHF	TE340	No	27	18	28	Yes	Key	4	45.75	Int Tune	10	Sw, C(VHF) Con (UHF)	PJ



Atlantic Video Corp. (Sterling) 18 Clinton St. Brooklyn, N. Y.	S20CM, S20SM, S20DCM, S21CM, S21SM, S21DCM S20TM, S21TM S24SM S24TM X20SM, X21SM, 620CM, 621CM, 720DCM, 721DCM X24SM X27SM, 1127CM X30SM S20TM, S21TM 824TM 927TM 1230TM	S20 S20 S20 S20 630 630 630 630 630 630 630 630	20-21 20-21 24 24 20-21 24 27 30 20-21 24 27 30	No No No No AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup> AM <sup>6</sup>	14 14 16 16 16 18 20 25 16 18 24 27 25	20 20 20 20 30 30 31 31 30 30 30 31 31	Yes Yes Yes Yes No No No No No No No No No	Key Key Key Key Key Key Key Key Key Key Key Key Key	3 3 3 3 4 4 4 4 4 4 4 4 4	23 4 23 4 23 4 23 4 25 7 25 7 25 7 25 7 25 7 25 7 25 7 25 7	Strip Strip Strip Strip Strip Strip Strip Strip Strip Strip Strip Strip	12 4x6 12 8 12 12 12 12 4x6 8 8 8	Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C	No No No No No No No No No No No No	
	Automatic Radio & Mfg. Co., Inc. 122 Brookline Ave., Boston, Mass.	5116 5120 5160 5217 5220	No No No No No	17 20 17 17 20	No No No No No	14 14 14 14 14	21 21 21 21 21	Yes Yes Yes Yes Yes	Ord Ord Ord Ord Ord	3 3 3 3 3	25 75 25 75 25 75 25 75 25 75		8 8 8 5½ 5½	Sw Sw Sw Sw Sw	No No No No No
	Bace Television Corp. Green & Leuning St. So. Hackensack, N. J.	Remote Control TM-24 P-80-82-83-84-85 P-80-Chinese Remote Control 27	630K3CB Remote Control 630K3CB 630K3CB	24 21 21 & 24 27	No No No No	15 14 14 21	31 30 30 41	No No No No	Key Key Key Key	4 4 4 4	26 25 26 25 26 25 26 25	Strip Strip Strip Strip	12 12 12 12	Tur, C Tur, C Tur, C Tur, C	RC BAR No
	Bell Television, Inc. 552 West 53rd Street New York 19, N. Y.	R917 R921 R924	1731 2131 2431	17 20CP4 24AP4	No No No	10 12 15	31 31 31	No No No	Key Key Key	4 4 4	25 75 25 75 25 75	Int Conv Int Conv Int Conv	12 12 12	Tur Tur Tur	RC RC RC
	Bendix Radio Baltimore 4, Md.	1702 17K2 20K2 20L2 21T3, 21X3 21K3, OAK3 21KD KM17C TM17C	T5 T9 T9 T9 T14 T14 T14 T14 T14	17BP4 17BP4 20 20 21 21 21 17 17	No No No No No No No No No	12 12 12 12 14 14 14 14 14	17 22 22 22 24 24 24 24 24	Yes Yes Yes Yes Yes Yes Yes Yes Yes	Ord Key Key Key Key Key Key Key Key	2 3 3 3 4 4 4 4 4	26 75 26 75 26 75 26 75 45 75 45 75 45 75 45 75 45 75	Ex Conv Ex Conv Ex Conv Ex Conv Strip Strip Strip Strip Strip	6 10 12 6 6 10 12 6 10	Sw Sw Sw Sw Tur, C Tur, C Tur, C Tur, C Tur, C	No No No No No No No No No
	Capehart-Farnsworth Corf Ft. Wayne, Ind.	IT172MA 1C213M, -B, 2F213F, 3C212MA, - BA, 4H212MA, -BA, 4T213M, -B, 5F212MA, 6F213B, 7F212MA, 8F212BA, 9F212MA 10W212M 11W212MA 12F272M	CX37 CX36TVR CX37-C305 CX40	17 21 21 27	No AM AM-FM No	14 14 14 20	21 28 30 27	Yes Yes Yes Yes	Key Key Key Key	4 4 4 4	45 75 45 75 45 75 45 75	Strip Strip Strip Strip	12 12 2-12 10	Tur, C Tur, C Tur, C Tur, C	PJ Ph Ph PJ
	Cascade Television Co. 153 Chestnut Ave. Irvington 11, N. J.	503-1 503-2 503-3 503-4 LD-27 F42-4X3	K3 DXC K3-1 DXC-1 K3-2 K3-3	17 17 21 21 27 51		13 13 15 15 16 25	30 30 30 30 36 42	No No No No No No	Key Key Key Key Key Key	4 4 4 4 4 4	26 25 26 25 26 25 26 25 26 25 26 25	Strip Strip Strip Strip Strip Strip	12 12 12 12 12 12	Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C	PJ PJ PJ PJ RCS RCS
	Certified Radio Labs. 5507-13th Ave. Brooklyn 19, N. Y.	5320		20DP4	No	16	20	Yes	Ord	4	25 75	Strip	12	Tur, C	No



Manufacturer	Model	Chassis Number	A.M.-F.M.-SW	C-R Tube Type, or Size (In)	C-R Tube Anode KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I. F. Stages	Video I. F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks	
Conrac, Inc. Glendora, Calif.	35M61; 35W61; 36B61; 36P61; 37P61; 38M61; 38B61; 39M61 40M64; 40B64; 41B64; 41P64; 42P64 Fleetwood	61 64 600		21AP4 24AP4 21AP4 or 24AP4	18 18 18 20	24 24 27 28	Yes Yes Yes Yes	Ord Ord Ord Ord	4 4 4 4	25.75 25.75 25.75 25.75	Strip Strip Not supplied	12 12  12	Tur, C Tur, C  Tur, C Tur, C	CJ, PJ CJ, PJ  RC RC	
	45M67; 45P67														
Crosley Div., Avco Mfg. Corp. 1325 Arlington St. Cincinnati, Ohio	EU-17TOL, -17TOLB, EU-17COL, -17COLB, EU-17TOLU, -17TOLBU, -17COLU EU-17TOM, -17TOR, -17COM EU-21TOL, -21TOLB EU-21TOLU, -21TOLBU EU-21COL, -21COLB EU-21COLU, -21COLBU EU-21CDB, -21CDM, -21CDN, EU-21COB, -21COMA EU-21CDBU, -21CDMU, -21CDNU, EU-21COBU, -21COMU EU-21PDBU, -21PDMU EU-30COBU, -30COMU	385 396 380 386 393 387 394 381 390 392 388	No No No No No No No No No AM-FM No	17 17 17 21 21 21 21 21 21 30	13.5 13.5 13.5 13.5 13.5 13.5 14 14 14 23	18 20 18 22 20 18 20 22 25 31 34	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Ord Ord Key Ord Ord Ord Ord Key Key Key Key	3 3 3 3 3 3 4 4 4 4 4 4	26.4 26.4 26.4 26.4 26.4 26.4 26.4 26.4 26.4 26.4 26.4	Int Conv Int Tune Ex Conv Int Conv Int Tune Int Conv Int Tune Int Conv Int Tune Int Tune Int Tune	5 1/4 5 1/4 5 1/4 5 1/4 5 1/4 10 10 10 10 10 10	Sw Sw Con Sw Sw Sw Sw Con Con Con Con	No No No No No No No No No Ph No	
	ET-170, GT-174 ET-172 ET-190, GT-201D ET-200 GT-210 GT-211		No No No No No No	17 17 20 20 21 21	13.5 13.5 13.5 13.5 13.5 13.5	21 21 21 21 21 21	Yes Yes Yes Yes Yes Yes	Ord Ord Ord Ord Ord Ord	3 3 3 3 3 3	25.75 25.75 25.75 25.75 25.75 25.75	Strip Strip Strip Strip Strip Strip	6 1/2 10 10 6 1/2 6 1/2 10	Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C	No No No No No No	
	Allen B. DuMont Laboratories, Inc., 35 Market Street, East Paterson, N. J.	Devon Banbury, Flanders, Whitehall, Wickford, Wimbeldon Banbury, Dynastey, Newbury, Somerset Clinton Beverly, Milford, <sup>3</sup> Ridgewood, Shelburne, Wakefield	RA-160 RA-162A RA-162B RA-164 RA-165		17KP4 21KP4A 21KP4A 17HP4 21FP4A	16 16 16 14 14	26 26 27 21 21	Yes Yes Yes Yes Yes	Gate Gate Gate Key Key	4 4 4 3 3	45.75 45.75 45.75 25.75 25.75	Strip Strip Strip Strip Strip	6 10 10 5 10	Tur, C Tur, C Tur, C Tur, C Tur, C	PJ PJ  PD, PJ No No
	Electro Technical Industries 1432 N. Broad St., Phila. 21, Pa.	Telekit 19C-Universal	19C		17-21	16	16	Yes	Ord	3	25.75	Ex Conv	4x6	Sw	No
	Emerson Radio & Phono. Corp. 111 8th Ave., New York 11, N. Y.	711 716 719 720 721 723 727 731 733 736	120164B 120163D 120163D 120169B 120166D 120164B 120168D 120167D, 120152B 120169F, 120152F 120171B	No No No No No No No AM AM No	21 17 17 21 17 21 17 17 21 21	15 14 14 15 15 15 14 14 15 15	22 22 22 23 23 22 23 23 23 <sup>5</sup> 23	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Ord Ord Ord Ord Ord Ord Ord Ord Ord Ord	3 3 3 3 3 3 3 3 3 3	45.75 45.75 45.75 45.75 45.75 45.75 45.75 45.75 45.75 45.75	Strip Strip Strip Strip Strip Strip Strip Strip Strip Strip	6 6 12 6 6 6 6 6 6 6	Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C	PJ No No PJ No No No Cl, Ph Ph PJ







Manufacturer	Model	Chassis Number	AM-FM-SW	C-R Tube Type, or Size (In)	C-R Tube KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I.F. Stages	Video I.F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks
Industrial Television, Inc. 369 Lexington Ave., Clifton, N. J.	IT-76R IT-82R	1376 No	No No	20 20	14 16	20 26	Yes No	Ord Ord	3 3	21 25 21 9	Strip Strip	8 12	Tur Tur	No RC, Com
Jackson Industries Inc. 500 E. 40th Street Chicago 15, Ill.	17XC, 217C 17XT, 217T, 277T 20XC, 220C 20XT, 377T 221T, 477T 317C 320C 321C 321C	317A 317A 320A 320A 321A 317A 320A 321 321	No No No No No AM AM AM-FM AM-FM	17 17 20 20 21 17 20 21 21	13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5	20 20 20 20 20 20 20 20 20	Yes Yes Yes Yes Yes Yes Yes Yes Yes	Key Key Key Key Key Key Key Key Key	3 3 3 3 3 3 3 3 3	25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75	Strip Strip Strip Strip Strip Strip Strip Strip Strip	6 4x6 6-8 4x6 4x6 4x6 6 4x6 6-8	Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C7 Tur, C7	No No No No No No No No No
Jewel Radio Corp. 900 Passaic Ave. E. Newark, N. J.	17TW7 20CW7, 20TW7 <sup>3</sup> 21CW7, 21TW7 <sup>3</sup> 620CW7, 621CW7	TV7 TV7 TV7 TV7	No No No No	17 20 21 21	15.5 15.5 15.5 15.5	21 21 21 21	Yes Yes Yes Yes	Ord Ord Ord Ord	3 3 3 3	26 0 26 0 26 0 26 0	Strip Strip Strip Strip	5 10 10 6	Tur, C7 Tur, C7 Tur, C7 Tur, C7	P, VHB P, VHB P, VHB P, VHB
Kaye-Halbert Corp. 3623 Easthams Dr. Culver City, Calif.	None None	253DX 243	No No	20-24 20-24	16 16	24 24	No Yes	Key Key	3 3	25 25	Strip Strip	12 12	Tur, C Tur, C	RC RC
J. H. Keeney & Co., Inc. 2600 West 50th St. Chicago 32, Ill.	22F17TMX 22F21TMX C-17TM <sup>14</sup> C-21TM <sup>14</sup> C-21CM <sup>14</sup> K-17TM K-17CM K-21TM K-21CM	No No No No No No No No No No	No No No No No No No No No No	17 21 17 21 21 17 17 21 21 21	11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5 11.5-13.5	20 20 18 18 18 18 18 18 18 18	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Key Key Key Key Key Key Key Key Key Key	3 3 3 3 3 3 3 3 3 3	26 75 26 75 26 75 26 75 26 75 26 75 26 75 26 75 26 75 26 75	Strip Strip Strip Strip Strip Strip Strip Strip Strip Strip	5 8 5 5 5 8 5 8 5 8	Tur, C Tur, C Tur Tur Tur Tur Tur Tur Tur Tur	No No No No No No No No No No
Lion Manufacturing Corp. 2640 Belmont Ave., Chicago 18, Ill. The Magnavox Co. Fort Wayne, Indiana	21537 21638, 21739, 21840 MV45L (Normandy) MV68L (French Provincial) MV90L (Wedgewood) MV91L (Wedgewood) MV92L (Wedgewood) MV93L (Belvedere) MV94L (French Provincial) MV100L (Contemporary) MV102L (Empire) MV103L (Holiday) MV104H (Envoy) MV106L (Constellation)	537 537 CT341K, -351J, -362L <sup>17</sup> CT342K, -352J CT342K, -352J CT346K, -353J CT352J CT363L, -373M CT352J, -362 <sup>17</sup> , -373M <sup>17</sup> CT341K, -351J CT341K, -351J, -362L <sup>17</sup> , -372M <sup>17</sup> CT347K, -357K CT341K, -351J	No No No No No No No No No No No No No No No	21 21 21 21 21 21 21 21 21 21 21 21 21 21 20	14 14 14 14 14 14 14 14 14 14 14 14 14 14	21 21 21 21 21 21 21 21 21 21 21 21 21 21 20	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Key Key Key Key Key Key Key Key Key Key Key Key Key Key Key	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75 25 75	Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv Int Conv	12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12 (2) 12	Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw Sw	No Ph Ph Ph Ph Ph Ph Ph Ph Ph Ph Ph Ph Ph No



## The Magnavox Co. (Continued)

Majestic Radio & Television  
Division of the Wilcox Gay Corp.  
70 Washington St.  
Brooklyn 1, N. Y.

MV107L (Playhouse)  
MV108L (Cosmopolitan)  
MV110M (International)

17T20, 17T21  
17C30, 17C31  
21  
21C30, 21C31, 21D40, 21D41,  
21D50, 21D51, 21F90, 21F91  
21F88, 21F89, 32, 33  
21P60, 21P61  
21P62, 21P63  
21T20, 21T21, 21T22, 21T23  
22, 30  
24, 25  
26, 27  
34, 35, 36

Series 106  
Series 106  
Series 106  
Series 111  
Series 108  
Series 110  
Series 110  
Series 111  
Series 106  
Series 108  
Series 108  
Series 108

No  
No  
No  
No  
No  
AM-FM  
AM-FM  
No  
No  
No  
No  
No

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

Mars Television  
112-33 Colonial Ave.  
Corona, L. I., N. Y.

Dartmouth, Regency<sup>10</sup>  
Dorset, Mandarin, Miami  
Hampton, Versailles  
Pasadena  
Riviera

630  
630  
630  
630  
630

FM<sup>7</sup>  
FM<sup>7</sup>  
FM<sup>7</sup>  
FM<sup>7</sup>  
FM<sup>7</sup>

20-21  
20-21-24  
20-21  
20  
20

13.5  
13.5  
13.5  
13.5  
13.5

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

Mattison Television & Radio Corp.  
893 Broadway,  
New York 3, N. Y.

Ambassador (17X-BB-6AB,  
21X-BB-6AB, 27X-BB-6AB)  
Berkshire (21X-BE-6A),  
Dorrest (21X-DO-6A),  
Heritage (21X-HE-6A)  
Cathay (20X-CC-6A),  
Continental (20X-CFO-6A),  
Diplomat (20X-CFDD-6A)  
Chinese Quadrille  
(17X-CFOO-6A, 21X-CFOO-6A)  
Quadrille  
(17X-CFOS-6A, 21X-CFOS-6A)  
Riviera  
(21X-R1-6A, 27X-R1-6AB)  
Silver Rocket 630  
Silver Rocket 630

630-6AB  
630-6A  
630-6A  
630-6A  
630-6A  
630-6AB  
630-6AB  
630-6AB  
630-6AB

No  
No  
No  
No  
No  
No  
No  
No  
No

17, 21, 27  
21  
20  
17-21  
21-27  
17, 20, 21, 24  
17, 20, 21, 24  
17, 20, 21, 24  
17, 20, 21, 24

15-16  
15  
15  
15  
15-16  
15  
15  
15  
15

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

21  
21  
27

John Meck Industries  
Plymouth, Ind.

JM717C  
JM720C  
JM721C  
MM616T

9032  
9032  
9032  
9033

No  
No  
No  
No

17HP4  
20HP4  
21FP4  
17HP4

12.5  
12.5  
12.5  
12.5

20  
20  
20  
19

Yes  
Yes  
Yes  
Yes

Ord  
Ord  
Ord  
Ord

26.1  
26.1  
26.1  
26.1

Strip  
Strip  
Strip  
Strip

8  
8  
8  
5

Tur  
Tur  
Tur  
Tur

No  
No  
No  
No

21  
21  
27

14  
14  
20

21  
21  
27

Midwest Radio & Television Corp.,  
901-911 Broadway  
Cincinnati 2, Ohio

N-20  
NC-20  
NV-20

BT-20  
BT-20  
CV-20

AM-FM  
AM-FM  
No

20  
20  
20

14  
14  
14

24  
24  
24

Yes  
Yes  
Yes

Key  
Key  
Key

25.75  
25.75  
25.75

12ED  
12ED  
12ED

Sw  
Sw  
Sw

No  
No  
No

21  
21  
27

14  
14  
20

21  
21  
27

14  
14  
20

Mitchell Manufacturing Company  
2525 Clybourn Avenue  
Chicago 14, Ill.

T-172  
T-212

MR  
MS

No  
No

17TP4  
21MP4

14.1  
14.1

19  
19

Yes  
Yes

Ord  
Ord

26.4  
26.4

Strip  
Strip

8  
8

Tur  
Tur

No  
No

21  
21

14  
14

21  
21



Manufacturer	Model	Chassis Number	AM-FM-SW	C-R Tube Type, or Size (In)	C-R Tube Anode KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I.F. Stages	Video I. F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks
Motorola, Inc., 4545 Augusta Blvd., Chicago, Ill.	17F13	TS408	AM	17	16	17	Yes	Ord	3	21	IntTun& Ex Conv	10	Sw, C	Ph
	17K14, 17K15	TS408	No	17	16	17	Yes	Ord	3	21	IntTun& Ex Conv	8	Sw, C	No
	17K16	TS408	No	17	16	17	Yes	Ord	3	21	IntTun& Ex Conv	6 x 9	Sw, C	No
	17T11, 17T12	TS408	No	17	16	17	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw, C	No
	17T13	TS419	No	17	16	16	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw	No
	21C1	TS292	No	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw, C	No
	21F2, 21F3	TS292	AM-FM	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	10	Sw, C	Ph
	21K4, 21K5, 21K6, 21K7	TS292	No	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	10	Sw, C	No
	21T3	TS501	No	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw, C	No
	21T4	TS324, TS292	No	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw, C	No
	21T5	TS324	No	21	18	17	Yes	Ord	3	21	IntTun& Ex Conv	6	Sw, C	No
	27K1	TS601	No	27	20	18	Yes	Ord	3	21	IntTun& Ex Conv	10	Sw, C	No
Muntz T.V. 1735 Belmont Ave., Chicago, Ill.	2055	17B2	No	20CP4A	16	17	Yes	Ord	3	22	Strip	5 1/4	Sw	No
	2158A, 2159A, 2162A <sup>3</sup>	17B6	No	21EP4A	16	17	Yes	Ord	3	22	Strip	10	Tur, C	No
	2763A, 2765A	17B8	No	27NP4A	18	18	Yes	Ord	3	22	Strip	10	Tur, C	No
	17C44	TK	No	17HP4	15	19	Yes	Ord	3	26.25	Strip	10	Tur, C	Cl
	17K32	TG	AM	17HP4	14	27	Yes	Ord	4	25.75	Strip	10	Tur, C	Ph
	17K41, 17K42	TK	AM	17HP4	15	19	Yes	Ord	3	26.25	Strip	10	Tur, C	Ph
	17T34	TG	No	17HP4	14	22	Yes	Ord	4	25.75	Strip	5	Tur, C	No
	17T40, 17T48	TK	No	17HP4	15	19	Yes	Ord	3	26.25	Strip	5	Tur, C	No
	20C45, 20C52	TL	No	20HP4A	15	19	Yes	Ord	3	26.25	Strip	10	Tur, C	Cl
	20C53, 20D29, 20T46 <sup>3</sup> , 20T47 <sup>3</sup>	TL	No	20HP4A	15	19	Yes	Ord	3	26.25	Strip	10	Tur, C	Cl
	20K43	TL	AM	20HP4A	15	19	Yes	Ord	3	26.25	Strip	10	Tur, C	Ph
	21D29, 21T27 <sup>3</sup>	TH	No	21AP4	15	22	Yes	Ord	4	25.75	Strip	10	Tur, C	No
	21K26	TH	AM	21AP4	15	22	Yes	Ord	4	25.75	Strip	10	Tur, C	Ph
Pacific Mercury Television Mfg. Corp. 5955 Van Nuys Blvd. Van Nuys, Calif.	2081	150-4	AM	20CP4	15	23	Yes	Key	3	26.1	Strip	8	Tur	Ph
	2113, 2115	150-81	No	21MP4	15	21	Yes	Key	3	26.1	Strip	8	Tur	C
	2116, 2117, 4421	150-81	No	21MP4	15	21	Yes	Key	3	26.1	Strip	5	Tur	C
	2152	150-81	No	21MP4	15	21	Yes	Key	3	26.1	Strip	10	Tur	C
	2181	150-61	AM	21MP4	15	23	Yes	Key	3	26.1	Int Conv	8	Tur	C
	2192	150-10	AM	21MP4	15	23	Yes	Key	3	26.1	Strip	8	Tur	C
	2401	150-51	No	24AP4	15	21	Yes	Key	3	26.1	Strip	10	Tur	C
	4317	150-9	No	17HP4	14	21	Yes	Key	3	26.1	Strip	5	Tur	C
	4320	150-15	No	20HP4	15	21	Yes	Key	3	26.1	Strip	5	Tur	C
	4721	150-10	AM	21MP4	15	23	Yes	Key	3	26.1	Strip	5	Tur	C



2721 Sup. Dlx. 2722 2723 Std., 2724 2725 Dlx. 2726 2727 2728	2720 2720 2720 2720 2721 2721 2722	No No No No AM AM	21 21 21 21 21 24	15 15 15 15 15 15	27 Yes 27 Yes 27 Yes 27 Yes 29 Yes 29 Yes	Key Key Key Key Key Key	4 4 4 4 4 4	25.0 25.0 25.0 25.0 25.0 25.0	Strip Strip Strip Strip Strip Strip	10 10 6 10 10 (2) 6x9	Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C	C PJ, C PJ, C PJ, C PJ, C Ph Ph
Philharmonic Radio & TV 235 Jersey Ave. New Brunswick, N. J.	817	No	17BP4	12	19 Yes	Ord	3	25.75	Strip	5	Sw, C	PJ
	920	No	20CP4	12	19 Yes	Ord	3	25.75	Strip	5	Tur, C	PJ
	921	No	21EP4	12	19 Yes	Ord	3	25.75	Strip	5	Tur, C	PJ
	924	No	24AP4	12	19 Yes	Ord	3	25.75	Strip	(2) 8	Tur, C	PJ
	8117	No	17BP4	12	19 Yes	Ord	3	25.75	Strip	8	Sw, C	PJ
	9120	No	20CP4	12	19 Yes	Ord	3	25.75	Strip	8	Tur, C	PJ
	9121	No	21EP4	12	19 Yes	Ord	3	25.75	Strip	8	Tur, C	PJ
	9820	No	20CP4	12	19 Yes	Ord	3	25.75	Strip	10	Tur, C	PJ
	9821	No	21EP4	12	19 Yes	Ord	3	25.75	Strip	10	Tur, C	PJ
	9821 Decorator models	No	21EP4	12	19 Yes	Ord	3	25.75	Strip	(2) 8	Tur, C	PJ
Philmore Manufacturing Co., Inc. 113 University Place New York, N. Y.	731D	No	17-24	15	31 No	Key	4	25.75	Strip	12	Tur, C	PJ
	731S	No	17-24	15	30 No	Key	4	25.75	Strip	12	Tur, C	PJ
Radio Craftsmen, Inc. 4401 N. Ravenswood Chicago 40, Ill.	None	No	17HP4, 21FP4A or 24BP4A	16	27 No	Key	4	26.1	Strip	None	Tur, C	No
	C202	No	17HP4	12.5	18 Yes	Ord	3	25	UHFT	5	Con, C	No
Raytheon Television and Radio Corporation 5927 West Dickens Ave. Chicago, Ill.	17T1	No	17HP4	12.5	20 Yes	Ord	3	25	UHFT	5	Con, C	No
	17T2	No	17HP4	12.5	20 Yes	Ord	3	25	UHFT	5	Con, C	No
	17T3	No	17HP4	12.5	18 Yes	Ord	3	25	UHFT	6	Con, C	No
	17T4	No	17HP4	12.5	18 Yes	Ord	3	25	UHFT	6	Con, C	No
	21T1	No	21FP4A	12.5	18 Yes	Ord	3	25	UHFT	5	Con, C	No
	21T2	No	21FP4A	12.5	18 Yes	Ord	3	25	UHFT	10	Con, C	No
	21T3	No	21FP4A	12.5	18 Yes	Ord	3	25	UHFT	10	Con, C	No
	21T4	No	21FP4A	12.5	18 Yes	Ord	3	25	UHFT	10	Con, C	No
	21T5	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T6	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T7	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T8	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T9	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T10	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T11	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T12	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T13	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T14	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
	21T15	AM	21FP4A	17.5	29 Yes	Key	4	25	Int Tune	10	Con, C	No
RCA Victor Division Radio Corporation of America Camden, N. J.	17T200	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	17T201	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	17T202	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	17T211	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	17T220	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	17T250DE Brett	No	17QP4	15.0	23 Yes	Key	4	41	Ex Conv, X	8	Sw, C	PJ
	17T261DE Ainsworth	No	17QP4	15.0	23 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	21T207 Crandall	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	21T208 Lambert	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	21T217 Brookfield	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	21T218 Lansford	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	12	Sw, C	PJ
	21T227 Lindale	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	12	Sw, C	PJ
	21T228 Brandon	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	12	Sw, C	PJ
	21T229 Belgrove	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	21T159DE Selfridge	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	8	Sw, C	PJ
	21T165DE Meredith	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	21T166DE Farrington	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	21T174DE Bancroft	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	KCS72	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	KCS72	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	KCS72	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	5	Sw, C	PJ
	KCS72	No	17QP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	KCS74	No	17QP4	15.0	23 Yes	Key	4	41	Ex Conv, X	8	Sw, C	PJ
	KCS74	No	17QP4	15.0	23 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	KCS72A	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	KCS72A	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	KCS72A	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	8	Sw, C	PJ
	KCS72A	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	12	Sw, C	PJ
	KCS72A	No	21AP4	13.6	23 Yes	Key	3	21	Ex Conv	12	Sw, C	PJ
	KCS68F	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	8	Sw, C	PJ
	KCS68F	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	KCS68F	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ
	KCS68F	No	21AP4	17.5	25 Yes	Key	4	41	Ex Conv, X	12	Sw, C	PJ



Manufacturer	Model	Chassis Number	AM-FM-SW	C-R Tube Type, or Size (In)	C-R Tube Anode KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I. F. Stages	Video I. F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks
RCA Victor Division (Continued)	21T175DE Benton	KCS68F	No	21AP4	17.5	25	Yes	Key	4	41	Ex Conv, X	12	Sw, C	Pj
	21T176DE Suffolk	KCS68F	No	21AP4	17.5	25	Yes	Key	4	41	Ex Conv, X	12	Sw, C	Pj
	21T177DE Donley	KCS68F	No	21AP4	17.5	25	Yes	Key	4	41	Ex Conv, X	12	Sw, C	Pj
	21T178DE Rockingham	KCS68F	No	21AP4	17.5	25	Yes	Key	4	41	Ex Conv, X	12	Sw, C	Pj
	21T179DE Clarendon	KCS68F	No	21AP4	17.5	25	Yes	Key	4	41	Ex Conv, X	12	Sw, C	Pj
	21T242 Westland	KCS72D1	AM	21AP4	13.6	29	Yes	Key	4	41	Ex Conv, X	12	Sw, C	3 Pj
	21T244 Penfield	KCS72D2	AM-FM	21AP4	13.6	33	Yes	Key	3	21	Ex Conv	12	Sw, C	3 Pj
	21T197DE Sunderland	KCS68H	AM-FM	21AP4	17.5	34	Yes	Key	4	41	Ex Conv, X	12	Sw, C	3 Pj
	17C11, 17H11, 17T3 11	CH-20-98	No	17	12.5	20-21	Yes	Ord	21	26.1	Strip	8	Tur, C	No
	20C11, 20T3 11	CH-20-98	No	20	14	20-21	Yes	Ord	21	26.1	Strip	8	Tur, C	No
Regal Electronics Corp. 603 West 130th St. New York 27, N. Y.	21C11, 21H11, 21T3 11	CH-20-98	No	21	14	20-21	Yes	Ord	21	26.1	Strip	8	Tur, C	No
	817TU-817CU	9030	No	17HP4	12.5	20	Yes	Ord	4	26.1	Strip	10	Tur, C	No
	820TU-820CU	9030	No	20HP4 or 21FP4	12.5	20	Yes	Ord	4	26.1	Strip	10	Tur, C	No
	1510TA	9029	AM-FM	30HP4 or 21FP4	12.5	20	Yes	Ord	4	26.1	Strip	12 <sup>12</sup>	Tur, C	Ph
	924XW 1000XTC	9031 9031	No AM-FM	21FP4 24AP4	16.5 16.5	20 20	Yes Yes	Ord Ord	4 4	26.1 26.1	Strip Strip	15 <sup>12</sup>	Tur, C	Ph
Sentinel Radio Corporation 2100 Dempster Street Evanston, Illinois	1U454TM		No	17HP4	15	18	Yes	Ord	3	26.4	Strip	6	Tur, C	No
	1U455TM, -TB		No	21FP4A	15	18	Yes	Ord	3	26.4	Strip	6	Tur, C	No
	1U456CM, -CB, 1U457CM, -CB		No	21FP4A	15	18	Yes	Ord	3	26.4	Strip	10	Tur, C	No
	1U458TM		No	17HP4	15	26	Yes	Key	4	26.4	Strip	6	Tur, C	No
	1U459TM, -TB		No	21FP4A	15	26	Yes	Key	4	26.4	Strip	6	Tur, C	No
Setchell-Carlson, Inc. New Brighton, Minn.	1U460CM, -CB, 1U461CM, -CB, -FP		No	21FP4A	15	26	Yes	Key	4	26.4	Strip	10	Tur, C	No
	1U462CM, 1U463CM, -CB		No	27EP4	17	19	Yes	Ord	3	26.4	Strip	12	Tur, C	No
	53, 531	152	No	21FP4A	15	22	Yes	Key	4	25.6	Strip	10	Tur, C	HS HV, UC
	53WR, 531WR, 530L, 5302	152	AM	21FP4A	15	25	Yes	Key	4	25.6	Strip	10	Tur, C	HS HV, UC
	22L, 152L, 202L, 222L, 232L, 242L, 302L, 302L, 322L, 342L, 352L, 362L, 372L	224X	No	21MP4	15	23	No	Ord	3	26.75	Strip	12 & (2) 5	Tur, C	Pj
Shaw Television Corp. 195 Front St., Brooklyn 1, N. Y.	22L, 152L, 202L, 222L, 232L, 242L, 302L, 302L, 322L, 342L, 352L, 362L, 372L	224XR5	AM-FM	21MP4	15	28	No	Ord	3	26.75	Strip	12 & (2) 5	Tur, C	Ph
	2724, 2824	224X	No	24AP4	15	23	No	Ord	3	26.75	Strip	12 & (2) 5	Tur, C	Pj
	2724, 2824	224XR5	AM-FM	24AP4	15	28	No	Ord	3	26.75	Strip	12 & (2) 5	Tur, C	Ph
	17MT20	530-DX	No	17	14	23	Yes	Key	4	26.75	Strip	6	Tur, C	Pj
	21BT10, 21MT10	530-DX	No	21	14	23	Yes	Key	4	26.75	Strip	6	Tur, C	Pj
Sheraton Television Corp. 370 7th Ave. New York 1, N. Y.	21BC10, 21BD10, 21MC10, 21MD10	530-DX	No	21	14	23	Yes	Key	4	26.75	Strip	12	Tur, C	Pj
	27MC10, 27MD10	530-DX	No	27	18	32	Yes	Key	4	26.75	Strip	12	Tur, C	Pj
			No				Yes	Key	4	26.75	Strip	6	Tur, C	Pj
			No				Yes	Key	4	26.75	Strip	12	Tur, C	Pj
			No				Yes	Key	4	26.75	Strip	12	Tur, C	Pj
Harold Shevers, Inc. 123 W. 64th St. New York City 23, N. Y.	B217S		No	17-21	12-14	17	Yes	Ord	3	25	Strip	6 in Table	Tur	No
	P217		No	8AP4	8	17	Yes	Ord	3	25	Strip	10 in Console	Tur	P
	227S		No	17	9	27	Yes	Ord	4	23.75	Strip	4x6	Tur	A.C.-D.C.
	318S		No	21	14	18	Yes	Ord	3	25	Strip	6	Tur	A.C.-D.C.
	319S		No	21	12	19	Yes	Ord	3	25	Strip	6	Tur	A.C.-D.C.
	323S		No	21	14	23	Yes	Ord	3	23.75	Strip	6	Tur	RC

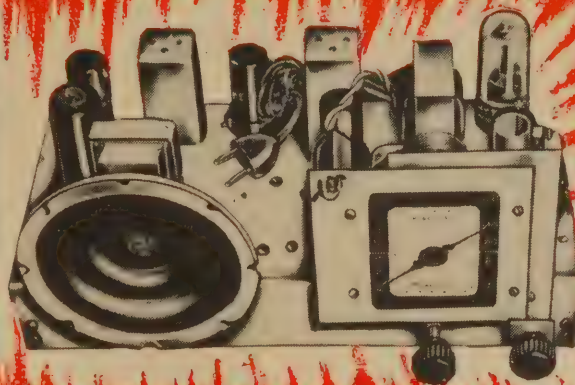


421, 422 423, 424, 425, 426		421, 422 423, 424, 425, 426		17TP4 21MP4		14 14		19 19		Yes Yes		Ord Ord		3 3		26 4 26 4		Strip Strip		8 8		Tur Tur		No No	
Sonora Radio & Telev. Corp. 2023 W. Carroll, Chicago 12, Ill.		421, 422 423, 424, 425, 426		17TP4 21MP4		14 14		19 19		Yes Yes		Ord Ord		3 3		26 4 26 4		Strip Strip		8 8		Tur Tur		No No	
Spartan Radio-Television 2400 E. Ganson St. Jackson, Mich.		5301 (Danbury) 5925 (Devonshire) 5340 (Glenhurst) 5342 (Gilmore) 5362 (Radford) 5380 (Courtland) 5382 (Carrington), 5384 (Crestwood), 5386 (Courtney) 5392 (Cambridge)		17 17 21 21 17 21		14 14 16 14 14 16		21 25 21 25 25 21		Yes Yes Yes Yes Yes Yes		Ord Key Ord Key Key Ord		3 4 3 4 3 4		26 25 26 25 26 25 26 25 26 25 26 25		Strip Strip Strip Strip Strip Strip		6 6 6 10 10		Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C		No No No No No No	
Starrett Television 601 W. 26th St. New York 1, N. Y.		17CG 17TG, 17TW 20TG, 20TW 20CD, 20C2		21 21 20 20		16 16 13.3 13.3		25 25 20 20		Yes Yes Yes Yes		Key Key Ord Ord		4 4 3 3		26 25 26 25 25.75 25.75		Strip Strip Strip Strip		10 10		Tur, C Tur, C		No No	
Stewart-Warner Electric 1300 N. Kostner Ave. Chicago 51, Ill.		20C-9124-A 21T-9132-A 21T-9210-A, 21T-9211-B, -C 21C-9211-D, -E, -F 27C-9212-A		20C-P4 21AP4 21AP4 21AP4 27NP4		12.5 12.5 12.5 12.5 18		31 26 19 19 21		Yes Yes Yes Yes Yes		Key Key Ord Ord Ord		4 4 3 3 4		26 75 26 75 26 75 26 75 26 75		Strip Strip Strip Strip Strip		12 6 6 6x9 6x9		Tur, C Tur, C Tur, C Tur, C Tur, C		Pj Pj Pj Pj Pj	
Stromberg-Carlson Co. Rochester 3, N. Y.		Classic 21 (521C5Dec.) Classic 21 (521C5O) Classic 21 (521C5M) Yorkshire (521CDM) Invader II (521CM) Panavue (521T)		21 21 21 21 21 21		17 17 17 17 17 17		24 24 24 24 24 24		Yes Yes Yes Yes Yes Yes		Key Key Key Key Key Key		4 4 4 4 4 4		26 4 26 4 26 4 26 4 26 4 26 4		Strip Strip Strip Strip Strip Strip		8 8 8 8 3 1/2		Tur, C Tur, C Tur, C Tur, C Tur, C Tur, C		Pj Pj Pj Pj Pj Pj	
Sylvania Electric Corp. Radio & Tel. Division 254 Rano St. Buffalo, N. Y.		105 120 126 150 155 172, 176, 177 175 178 187		17 21 21 17 17 21 21 27		16 16 16 16 17 17 17 22		24 23 24 24 28 28 28 35		Yes Yes Yes Yes Yes Yes Yes Yes		Key Key Key Key Key Key Key Key		4 4 4 4 4 4 4 5		26 8 45 75 45 75 26 4 26 4 45 75 45 75 45 75		UHFT UHFT UHFT Ex Conv Ex Conv UHFT UHFT UHFT		6 1/2 6 1/2 8 6 1/2 6 1/2 10 6 1/2		Sw Sw Sw Sw Sw, C Tur, C Sw, C Sw- v.h.f. Con- u.h.f.		No No No No No Halo Halo Halo, Ph Halo, RC	
Tech-Master Products Co. 443 Broadway, New York 13, N. Y.		C30 630D24 630S24 1930RC 2430 2431 2431C 5219 5321		24 Up to 24 Up to 24 21 Up to 24 Up to 24 Up to 24 17 21		15.5 16 16 16 16 16 16 16		30 30 30 30 31 31 19 21		No No No No No No Yes Yes		Ord Key Key Key Key Key Ord Ord		4 4 4 4 4 4 3 3		26 4 25 75 25 75 26.4 26.4 26.4 26.4 26.4		Strip Strip Strip Strip Strip Strip Strip Strip		12 12 12 12 12 12 8 8		Tur, C Tur, C Tur, C Tur, C Tur, C Con Tur Tur		Pj K <sup>15</sup> K Pj Pj Pj Pj A.C.-D.C. A.C.-D.C.	



Manufacturer	Model	Chassis Number	AM-FM-SW	C-R Tube Type, or Size (In)	C-R Tube Anode KV	Number of Tubes	Intercarrier Sound	Type A.G.C. (Keyed or Standard)	No. Video I. F. Stages	Video I. F. (MC)	U.H.F. Tuning	Speaker Size (In)	Tuner Type	Accessories Remarks
Tele King Corp. 601 W. 26th St. New York, N. Y.	K11, K11B	TVJ	No	21	14-15	17	Yes	Ord	3	25.1	Int Conv	4x6	Sw	No
	K72, K72B, K74	TVJ	No	17	14-15	17	Yes	Ord	3	25.1	Int Conv	4x6	Sw	No
	KC11, KC11B, KD11, KD11B, KD12C, KD12M, KD13	TVJ	No	21	14-15	17	Yes	Ord	3	25.1	Int Conv	10	Sw	No
	KC71, KC72B	TVJ	No	17	14-15	17	Yes	Ord	3	25.1	Int Conv	10	Sw	No
	KD11X, KD11XB	TVJ	AM	21	14-15	17	Yes	Ord	3	25.1	Int Conv	10	Sw	No
	KD27, KD28	TVJ27	No	27	17-18	17	Yes	Ord	3	25.1	Int Conv	10	Sw	3P1
	KD71X, KD71XB	TVJ	AM	17	14-15	17	Yes	Ord	3	25.1	Int Conv	10	Sw	3P1
	C2052	T1853	No	20HP4	13.5	18	Yes	Ord	3	26.75	Strip	8	Tur	No
	C2152	T1853	No	21FP4	13.5	18	Yes	Ord	3	26.75	Strip	10	Tur	No
	A-5		FM7	17-21	12	25	No	Ord	4	26.25	Ex Conv	6x9	Sw	RC7, Ph7
Trav-Ler Radio Corp. 571 West Jackson Blvd. Chicago 6, Illinois		217-31	No	17	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		217-32	No	17	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		217-33	No	17	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		217-37	No	17	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		220-34	No	20	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		220-35	No	20	11.2	21	Yes	Ord	3	26.25	Strip	4x6	Tur, C	No
		221-36	No	21	11.2	21	Yes	Ord	3	26.25	Strip	6x9	Tur, C	No
Video Products Corp. Red Bank, New Jersey	530	530DX		16-21	14	23	Yes	Key	4	26.25	Strip	12	Tur, C	PJ
	630	630DXC, 630K3C		16-21	14	30	No	Key	4	26.25	Strip	12	Tur, C	PJ
Westinghouse Electric Corp. Television-Radio Division Sunnyvale, Penna.		630K24-DXC		24	15.5	30	No	Key	4	26.25	Strip	12	Tur, C	PJ
	H-667T17, H-668T17	V-2216-1	No	17	13.5	22	Yes	Key	3	45.75	Int Conv	5 1/4	Sw	No
	H-676T21	V-2217-1	No	21	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-681T17	V-2215-1	No	17	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-679K17	V-2215-2 & -3	No	17	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw, C	No
	H-678K17, H-679K17	V-2216-1	No	17	13.5	22	Yes	Key	3	44	Int Conv	10	Sw	No
	H-688K24	V-2219-1	No	24	16	24	Yes	Key	3	44	Int Conv	10	Sw	No
	H-689T16	V-2214-1	No	16	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-690K21, H-691K21	V-2217-1	No	21	13.5	22	Yes	Key	3	44	Int Conv	10	Sw	No
	H-673K21, H-692T21	V-2217-2	No	21	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-695K21	V-2217-2, V-2217-3	No	21	13.5	22	Yes	Key	3	44	Int Conv	10	Sw	No
	H-699K17, H-702K17, H-703K17, H-705K17	V-2216-2	No	17	13.5	22	Yes	Key	3	44	Int Conv	10	Sw, C	No
	H-700T17, H-701T17	V-2216-2	No	17	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-704T17	V-2216-2, V-2216-4, -5	No	17	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw, C	No
	H-706T16	V-2207-1	No	16	13.5	21	Yes	Key	3	44	Ex Conv	5 1/4	Sw	No
	H-708T20	V-2220-1, V-2220-3, -11	No	20	13.5	21	Yes	Key	3	44	Ex Conv	5 1/4	Sw, C	No
	H-710T21	V-2217-2	No	21	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-711T21	V-2217-3, -4	No	21	13.5	22	Yes	Key	3	44	Int Conv	5 1/4	Sw	No
	H-713K21	V-2217-5	No	21	13.5	23	Yes	Key	3	44	Int Conv	5 1/4	Sw, C	No
	H-714K21, H-720K21	V-2217-2	No	21	13.5	22	Yes	Key	3	44	Int Conv	10	Sw, C	No
	H-721K21	V-2217-2	No	21	13.5	22	Yes	Key	3	44	Int Conv	10	Sw	No
		V-2217-3 & -4	No	21	13.5	22	Yes	Key	3	44	Int Conv	10	Sw, C	No



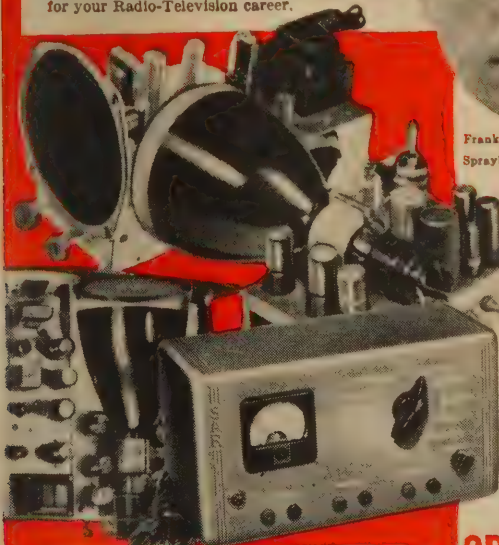


# TRAIN **FASTER**—TRAIN **BETTER**—TRAIN **EASIER** IN 10 MONTHS—OR LESS—FOR **RADIO-TELEVISION**

Our 21st Year Training Men for Greater Incomes and Security in Radio-Television

## I SEND YOU 18 BIG KITS

of Radio Television parts and equipment. Much of your training will be actual construction and experimentation . . . the kind of truly PRACTICAL instruction that prepares you for your Radio-Television career.



**YOU BUILD** the Television set and the powerful superhet radio receiver shown above. IN ADDITION to the other test units shown here (many are not shown because of lack of space). All equipment I send you is **YOURS TO KEEP**.

Approved for shipment under the U. S. Mail

I invite you to get all the facts—

**FREE TO YOU 3 BIG RADIO-TELEVISION BOOKS**

I want you to have ALL the facts about my new 10-MONTH Radio-Television Training—without cost! Rush coupon for my three big Radio-Television books: "How to Make Money in Radio-Television." PLUS my new illustrated Television Bulletin PLUS an actual sample Sprayberry Lesson—ALL FREE. No obligation and no salesman will call. Mail coupon NOW!



Frank L. Sprayberry  
President  
Sprayberry Academy  
of Radio

## NEW! NO OBLIGATION PLAN

**You Have No Monthly Payment Contract to Sign  
Pay For Your Training as You Earn and Learn**

You can get into Radio-Television, today's fastest growing big money opportunity field, in *months* instead of years! My completely new "package unit" training plan prepares you in as little as 10 months or even less! *No monthly payment contract to sign—thus NO RISK to you!* This is America's finest, most complete, practical training—gets you ready to handle any practical job in the booming Radio-Television industry. Start your own profitable Radio-Television shop . . . or accept a good paying job. I have trained hundreds of successful Radio-Television technicians during the past 21 years—and stand ready to train you, even if you have no previous experience! Mail coupon and get all the facts—FREE!

### Valuable Equipment Included With Training

The new Sprayberry "package" plan includes many big kits of genuine, professional Radio-Television equipment. You perform over 300 demonstrations, experiments and construction projects. You build a powerful 6-tube 2-band radio set, multi-range test meter, signal generator, signal tracer, many other projects. All equipment and lessons are *yours to keep* . . . you have practically everything you need to set up your own profitable Radio-Television service shop.

### Earn Extra Money While You Learn!

All your 10 months of training is IN YOUR HOME in spare hours. Keep on with your present job and income while learning. With each training "package" unit, you receive extra plans and "Business Builder" ideas for spare time Radio-Television jobs. New television stations everywhere, open vast new opportunities for trained Radio-Television Technicians—and those in training. If you expect to be in the armed forces later, there is no better preparation than practical Sprayberry Radio-Television training.

**SPRAYBERRY ACADEMY OF RADIO** 111 NORTH CANAL ST.  
Dept. 20-S, Chicago 6, Ill.

**MAIL COUPON  
TODAY!  
NO OBLIGATION**

**SPRAYBERRY ACADEMY OF RADIO, Dept. 20-S,  
111 North Canal St., Chicago 6, Ill.**

Please rush to me all information on your 10-MONTH Radio-Television Training Plan. I understand this does not obligate me and that no salesman will call upon me. Be sure to include 3 books FREE.

Name \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_



Manufacturer

(Continued from Page 82)

Model

Chassis Number

AM-FM-SW

C-R Tube Type, or Size (In)

C-R Tube Anode KV

Number of Tubes

Intercarrier Sound

Type A.G.C. (Keyed or Standard)

No. Video I.F. Stages

Video I. F. (MC)

U.H.F. Tuning

Speaker Size (In)

Tuner type

Accessories

Zenith Radio Corporation  
Chicago 39, Illinois

H-715K21, H-721K21

H-718K20

H-723K21

H-724T20, H-725T20

H-730C21

H-732C21

H-735C21

H-754K21

K1812R, K1812E

K1815R, K1815E

K1846R, K1850R, K1850E

K1880R, K2229R, K2235R, K2258R

K2286R

K2230R, K2240R,

K2240E, K2260R, K2263E,

K2266R, K2267E, K2268R

K2287R

K2290R, K2291E

K2872R, K2873E

V-2217-5

V-2220-2 & -4

V-2217-55

V-2217-5

V-2220-2 & -4

V-2218-1

V-2218-11 & -2

(Radio V-2180-9)

V-2218-1

V-2218-11 & 2

(Radio V-2180-10)

V-2217-4

V-2217-5

No

No

No

No

No

AM-FM

AM-FM

AM-FM

AM-FM

No

No

No

No

No

AM

No

AM-FM

AM-FM

No

21

20

21

21

20

21

21

21

21

21

21

21

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

17

A.C.-D.C.

BAR

Cascodes

Casters on cabinet

Color Jack

Clock

Commercial

Continuous

External converter needed

Halolight

Hermetically sealed high-voltage unit

Internal converter (number after indi- cates number of u.h.f. channels)

Int. Tune.

82-Channel tuner

K

P

PD

Ph

PJ

3PI

RC

RCS

Strip

SW

TB

Tun

Tur

Kit

Portable

Phono drawer

Phono

Phono Jack

3-speed player

Remote control

Remote chassis and ext. speakers

Snap-in coil strips to be added to 12-channel v.h.f. turret tuner

Switch

Tunable v.h.f. booster

V.h.f.-u.h.f. TV tuner

Turret

UC

UHFT

VHB

X

Unitized construction

Provision for u.h.f. tuning

Vertical and horizontal blanking

Exchange tuner

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

8-tube AM-FM chassis.

Has phono tack. Not available with phonograph.

Deluxe model with 21 tubes and 3 video stages available.

Coaxial speaker, 5 1/4" diameter.

Built-in 2-tube A.M. tuner.

Made under Craydon, de-name for E. C. Bonia Inc., 500 Fifth Ave., N.Y.C.

Major components mounted.

Also uses 6X11 speaker and 45-75 mc video i.f.

Has cascade tuner with 12" speaker.

Also available with 12" speaker.

External converter needed with switch type tuners.

The following corrections were too late to place on their proper pages

Bendix KM17C has a 10-inch speaker and TM17C has a 6-inch speaker.

Conrac Fleetwood is a custom installation receiver.

Emerson 731 has 23 tubes plus 5 for the AM radio.

Chassis numbers given for FADA Radio are model numbers.

The Hoffman model following 278710 is 27P71.

Video, I.F. on Industrial Television IT76-R is 25.75; on IT-82R is 26.4.

Jewell 620CW7 has 20-inch tube, Magnavox MV106L has a 12-inch speaker and a cascade tuner, otherwise identical with MV104H;

chassis MV107L is CT362L.

First six RCA models listed do not have cascade tuners.

Telo King models KD71X, KD71X8 have 17 tubes plus 5 for AM radio.

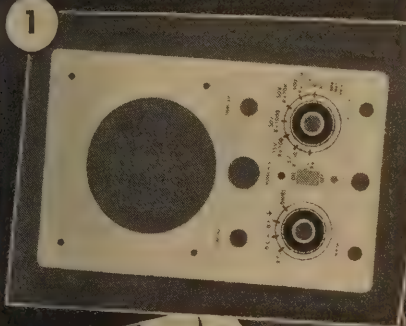
Westinghouse H-710T21 and H-711T21 have 21-inch tube, 13.5 KV anode voltage, intercarrier sound, keyed A.G.C. and 5 1/4 inch speaker.

Some manufacturers and models do not appear in this Directory.

In most cases, this was due to late arrival of information.



# Check these ADVANTAGES FOUND Only in HEATHKITS



**1. Baked Enamel Lifetime Finish Panels** — Oven baked finishes for maximum durability and freedom from mars, scratches and discoloration. Panels that can really take service shop and laboratory abuse.

**2. Save Money** — You save all expensive factory wiring costs when you build your own. And, direct factory to customer sales eliminate all middle man profits. You can have a complete Heathkit laboratory or service shop for what one or two pieces of ready built equipment cost.

**3. Modern Styling** — New "fitted panels" and formed cabinets with rounded corners present a smart, professional appearance. Dignified appearance for prestige.

**4. Quality Components Used Throughout** — Heathkits use well known, time and quality tested components such as Simpson, Chicago Transformer, Wilkor, Allen-Bradley, Altec-Lansing, Centralab, Cinch, Oak, Grigsby-Allison, Mallory and many others.

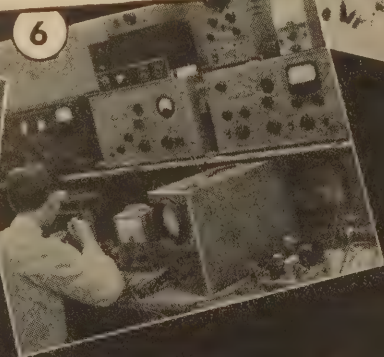
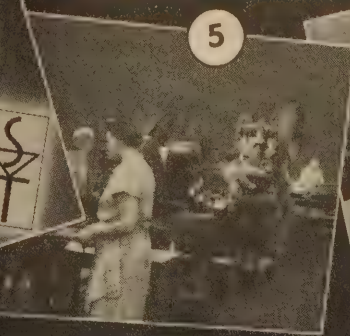
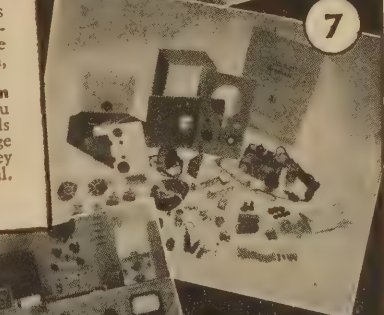
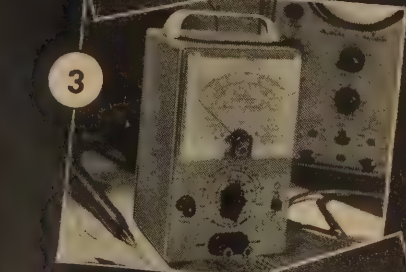
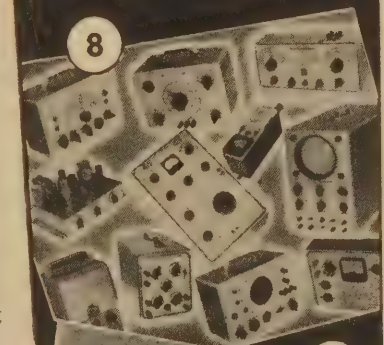
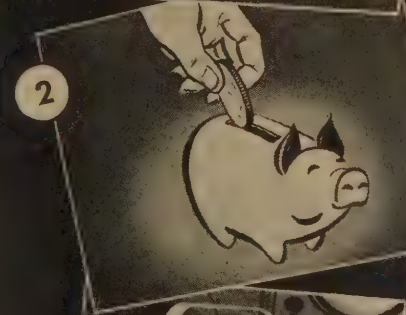
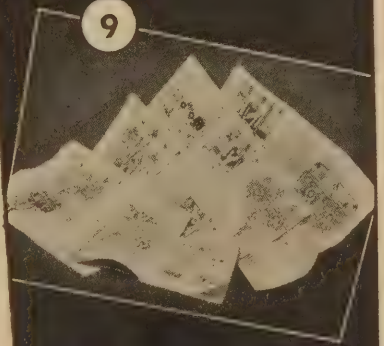
**5. Extensive Factory Facilities** — Shearing, punching, forming, spot welding, etc. is done right in our own plant — controlled production for highest quality and less cost to you.

**6. Extensive and careful engineering** — A staff of engineers working in a modern, well equipped laboratory carefully develop Heathkits according to highest engineering practices. Your assurance of accurate, up to the minute instruments.

**7. Complete Kits** — All the parts are right in the kit — you get all tubes, controls, transformers, meters — everything — no other components to buy. And no cutting, punching, or painting necessary — it's all done for you. Heathkits go together easily and smoothly.

**8. Only Complete Line** — Over 30 kits available — Heathkits form the only complete line of kit-form test equipment on the market. Kits for hams, engineers, service men, schools and audio enthusiasts.

**9. Detailed, Complete Instruction Manuals** — Comprehensive manuals tell you exactly how to build your Heathkit. Manuals contain easy-to-follow instructions, clear, large pictorials, schematic, detail drawings, etc. They make construction easy, fun, and educational.



## Nine New Heathkits This Year!

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY (16)  
CABLE: ARAB-N.Y.

# The HEATH COMPANY

BENTON HARBOR 20, MICHIGAN



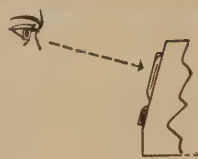
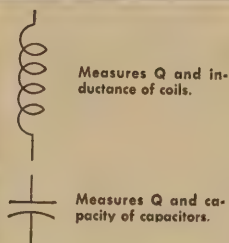
# NEW *Heathkit* "Q" METER KIT

• A HIGH QUALITY Q METER AT LOW COST.

MODEL QM-1

SHIPPING  
WT. 12 LBS.

**\$39<sup>50</sup>**



Slant face cabinet for ease in reading the meter.



• First Q METER within the price range of all.

• Read Q's of 0-500 directly on calibrated scale.

• Stable oscillator supplies R.F. frequencies of 150 kc to 18 megacycles.

• Calibrated capacitor with range of 40 mmf to 450 mmf with vernier of  $\pm 3$  mmf.

• Simple, easy operation.

• Can be used to measure small inductances or capacitors.

• Measures Q of condensers, RF resistance and distributed capacity of coils.

• Measures capacity by substitution, capacity by resonance, inductance by resonance.

• Slanted panel for convenient operation.

Another outstanding example of progressive HEATHKIT engineering. Now a highly desirable Q METER within the price range of all laboratories, schools and experimenters. No longer is it necessary to deny yourself the many measurement advantages offered by this instrument.

Use the new HEATHKIT Q METER for the following simple basic measurements: capacity by substitution, capacity by resonance, inductance by resonance and Q at the OPERATING frequency all can be read on the calibrated scales. The method used to obtain information regarding the Q of condensers, RF resistance, distributed capacity in coils, etc., is only slightly more involved. In the HEATHKIT Q METER, the generated RF signal is coupled through a cathode follower and injected across a low impedance condenser which is included in the resonant circuit under test. Large  $4\frac{1}{2}$ " 50 microampere Simpson meter reads Q directly. The resonating condenser and vernier condenser are calibrated in mmf for substitution method capacity tests. The resonating condenser is also calibrated in effective capacity for resonance tests. The inductance calibration serves for rapid determination of the approximate inductance of a coil. The HEATHKIT Q METER has a generator frequency range of 150 kc to 18 megacycles. Vernier capacity covers  $\pm 3$  mmf and the resonating condenser is calibrated from 40 mmf to 450 mmf actual capacity or 40 mmf to 350 mmf effective capacity. Meter reads Q directly up to 250. Higher and lower full scale readings can be obtained by varying the injection voltage levels.

The entire kit consists of 12AT7, 6AL5, 6C4, OD3 and 6X5 tubes, 50 microampere Simpson meter, power transformer, cabinet and all other parts necessary for construction as well as instructions for assembling, testing and operation of the completed instrument.

## *Heathkit* DECADE RESISTANCE KIT

The HEATHKIT DECADE RESISTANCE KIT is widely used by schools, experimenters and laboratories because of the extremely wide resistance range offered and the useful, dependable service provided. The DECADE consists of 5 rotary 2 deck ceramic wafer switches with silver plated contacts and twenty 1% precision resistors in a circuit which provides the resistance range of 1 ohm to 99,999 ohms in 1 ohm steps. The HEATHKIT DECADE RESISTANCE KIT is simple to construct and is housed in a beautiful polished birch cabinet with an attractive panel. The DECADE will furnish years of accurate trouble-free service.

Individual decade sections of above can be purchased separately for special applications.



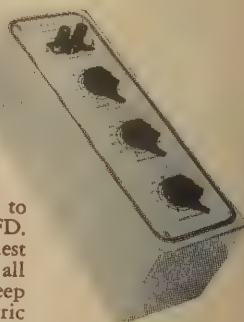
MODEL DR-1  
SHIPPING  
WT. 4 LBS.

**\$19.50**

## *Heathkit* DECADE CONDENSER KIT

Extremely useful in all experimental and design work such as determination of condenser values for: compensating networks, filters, bridge impedances, tuned circuits, etc. Uses all precision silver mica condensers within  $\pm 1\%$  accuracy. Values run in three decades from 100 MMFD to 0.111 MFD in steps of 100 MMFD. Smooth acting, positive detent, highest quality ceramic wafer switches make all capacitor values easy to set up and keep losses to a minimum. Low loss dielectric terminal board mounts on outside of panel for easy cleaning. Heathkit binding posts accommodate a wide variety of test leads. Comes complete with all parts, including polished birch cabinet.

Individual decade sections of above can be purchased separately.



MODEL DC-1  
SHIPPING  
WT. 4 LBS.

**\$16<sup>50</sup>**

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY 10

*The* **HEATH COMPANY**

... BENTON HARBOR 20, MICHIGAN



# NEW *Heathkit* OSCILLOSCOPE KIT

• NEW WIDE BAND VERTICAL AMPLIFIER  $\pm 2$  DB 10 CYCLES TO 1 MC.

Direct plate connections for modulation tests.

Displays TV sync pulses correctly.

Useful to 5 mc.

Good square wave response at 100 kc.

MODEL O-8

SHIPPING  
WT. 29 LBS.

**\$43.50**



• New wider band vertical amplifier  $\pm 2$  db from 10 cycles to 1 megacycle useful to over 5 megacycles.

• High sensitivity in vertical amplifier. .025 volts RMS per inch deflection.

• New 3 step input attenuator input ranges X1, X10, X100.

• New 5CP1 intensifier type tube for greater brilliance.

• Terminal board and rear cabinet opening provisions for direct connections to deflecting plates.

• Newly styled formed and ventilated aluminum cabinet.

• Wide band sweep generator, 15 cycles to over 100 kc. Will synchronize with 5 megacycle signal.

• 10 tube circuit featuring push pull operation of vertical and horizontal amplifiers.

• Internal synchronization on either positive or negative peaks.

• Reproduces faithfully the front and back porches of TV sync pulses. Excellent square wave reproduction to over 100 kc.

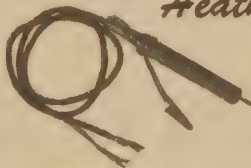
• Optional Intensifier kit available for 2200 volt operation.

Proudly announcing the new 1953 HEATHKIT Model O-8 OSCILLOSCOPE featuring the finest performance ever offered in this extremely popular kit instrument. Improved wider band vertical amplifier featuring a new 3-step input attenuator affording smooth control of the excellent .025 volts per inch vertical sensitivity. Possibility of overloading the vertical input circuit is minimized. Greater band width in the vertical channel is a decided advantage to TV service men. Permits clear observation of all TV sync pulse detail and excellent square wave reproduction over 100 kc. 5CP1 intensifier type CR tube provides a brilliant trace with normal accelerating voltages. A handsome, ventilated cabinet with smooth rounded corners and a snug fitting drawn panel adds to the smartly styled professional appearance. Longer life is assured through cooler instrument operation. Push pull output stages in both vertical and horizontal amplifiers for balanced deflection of the spot. All of the many fine features of the previous model have been retained. Rear cabinet access to terminal board for direct connection to CR plates. The entire kit of all 10 tubes, parts, cabinet and panel as well as detailed construction manual for assembly and operation of the instrument included.

**INTENSIFIER KIT:** For extreme trace brilliance in special applications such as photography, group demonstrations or operation in brightly lighted areas an optional Intensifier kit providing 2200 volt operation of the CR tube is available. Kit includes high voltage filter condenser, high voltage selenium rectifier, etc. \$7.50.

*Heathkit*

SCOPE  
DEMODULATOR PROBE KIT



No. 337  
SHIP. WT. 1 LB.

**\$4.50**

Trouble shooting or aligning TV, RF, IF and video stages requires demodulation of high frequency signals before Oscilloscope observation. The HEATHKIT SCOPE DEMODULATOR PROBE KIT was specifically developed for this application. Kit consists of a probe housing, crystal diode detector circuit, shielded cable and spade lugs. Assembly is simple and the probe will quickly prove its usefulness as an Oscilloscope accessory.

NEW *Heathkit*

## VOLTAGE CALIBRATOR KIT



MODEL VC-1  
SHIPPING  
WT. 5 LBS. **\$9.50**

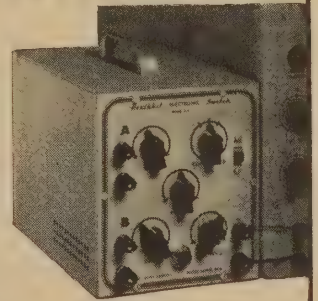
Use the Heathkit Voltage Calibrator with your oscilloscope to measure peak-to-peak TV complex waveshapes. TV manufacturer's specifications indicate correct peak-to-peak voltages and this kit will permit making these important measurements.

A big help to engineers in circuit work. Makes peak-to-peak voltage measurements of complex waveshapes of all kinds. Flat topped semi-square wave output of calibrator assures fast and easy measurement of any voltage between .01 and 100V peak-to-peak.

The Voltage Calibrator can remain connected to your oscilloscope at all times for instant use. "Signal" position connects signal under study directly through calibrator and into scope input circuit for direct observation. Eliminates transferring leads from calibrator. A wonderful scope accessory.

*Heathkit*

## ELECTRONIC SWITCH KIT



MODEL S-2  
SHIPPING  
WT. 11 LBS.

**\$19.50**

A few dollars spent for this accessory will increase the usefulness of a scope immeasurably. An electronic switch will open up a whole new field of scope applications for you. The S-2 allows TWO SIGNALS to be observed at the SAME TIME — this important feature allows you to immediately spot phase shift, clipping, distortion, etc. The two signals under observation can be superimposed or separated for individual study. Each signal input has an individual gain control for properly adjusting scope trace patterns. Has both coarse and fine frequency controls for adjusting switching time. Multivibrator switching frequency is from less than 10 cps to over 2000 cps in three overlapping ranges. Kit comes complete including 5 tubes, power transformer, all controls, instruction manual, etc. Every scope owner should have one!

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
138 40th ST.  
NEW YORK CITY 100  
CABLE: ARAB-N.Y.

*The* **HEATH COMPANY**

BENTON HARBOR 20, MICHIGAN



# Heathkit VACUUM TUBE

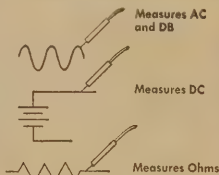
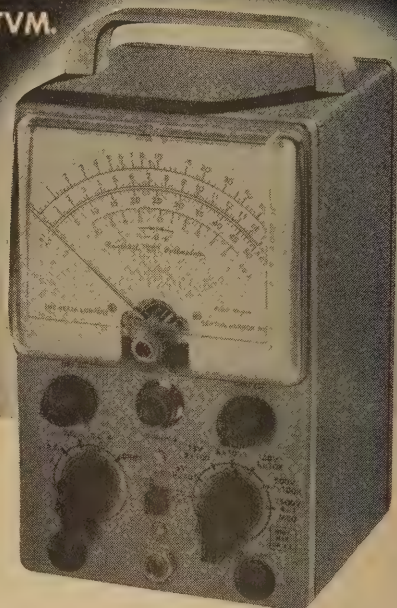
# VOLTMETER KIT

• NEW 1½ VOLT RANGE ON 1953 VTVM.

MODEL V-6

SHIPPING  
WT., 7 LBS.

\$24.50



• New 1½ volt low range gives over 2" of scale per volt instead of less than ¾" found on 5 volt range type.

• Increased accuracy due to expanded scales.

• New 1500 volt DC high range gives 50% greater coverage.

• Seven ranges in all. 1½, 5, 15, 50, 150, 500 and 1500 volts DC (1000 volts maximum AC only).

• Provides proper service ranges 150 volts for AC DC work and 500 volts for AC type service.

• High input impedance, 11 megohms minimizes circuit loading.

• Variety of accessory probe kits available.

• 1% precision resistors in multiplier circuits.

• 200 microampere Simpson meter.

• Center scale zero adjust.

• Transformer operated.

• Test leads included.

• New cabinet styling.

• Large, clearly marked meter scales indicate ohms, AC volts, DC volts and DB.

The 1953 Heathkit V-6 VTVM has improved ranges! The lowest range has been moved way down to 1.5V full scale. This gives 3½" of actual scale length for the 1.5V covered — that's 2½ inches per volt!! Now you can make your low level measurements faster and with greater accuracy.

And the upper range has been moved up. Readings up to 1500V DC can be readily made with new, improved VTVM — plus readings up to 1000V on AC. Higher ranges for extended use.

New vertical chassis mounting gives added chassis space for really easy wiring — no tight corners to worry about. Uses only highest quality components throughout. Simpson 200 microampere meter movement combined with 1% precision resistors in multiplier circuit insure highly accurate and dependable readings.

AC and DC voltage ranges are 0-1.5V-5V-15V-50V-150V-500V-1500V. (1000V max. reading on AC) — a total of seven ranges for convenient, accurate readings. Instrument also measures resistance from .1 ohm to over 1 billion ohms in seven handy ranges of RX1, X10, X100, X1000, X10K, X1 Meg., — all convenient multiples of 10 with no skips. Has Db scale in red for easy identification.

New panel has tough baked on enamel finish for freedom from scratches and maximum durability. Modern styled, formed, compact cabinet with rounded edges and crackle finish is truly handsome.

Comprehensive, detailed instruction manual with step-by-step instructions, figures, pictorials, etc. makes assembly a cinch.

Be sure and look over the special accessory VTVM probes below — for added usefulness.

## Heathkit R. F. PROBE KIT



SHIP. WT.  
1 LBS. \$5.50  
No. 309  
Extends RF range of  
HEATHKIT 11 megohm  
VTVM to 250  
megacycles ± 10%.

## Heathkit 30,000 V. D.C. PROBE KIT



SHIP. WT.  
2 LBS. \$5.50  
No. 336  
Provides DC multipli-  
cation factor of 100 for  
any 11 megohm VTVM.

## Heathkit PEAK TO PEAK VOLTAGE PROBE KIT



SHIP. WT.  
2 LBS. \$6.50  
No. 338  
Reads on DC scale of  
any 11 megohm  
VTVM 5 kc to 5  
megacycle range.

## NEW Heathkit BATTERY TESTER KIT

The new Heathkit Battery Tester measures all types of dry batteries between 1½ volts and 150 volts under actual load conditions. Readings are made directly on a three-color GOOD-WEAK-REPLACE scale that your customers can readily understand. Operation is extremely simple and merely requires that the leads be connected to the battery under test. Only one control to adjust in addition to a panel switch for A or B battery types.

The Heathkit Battery Tester features compact assembly. An accurate meter movement and wire wound control mount in the portable, rugged plastic case.

Use the BT-1 to check portable radio batteries, hearing aid batteries, lantern batteries and photo flash gun batteries.

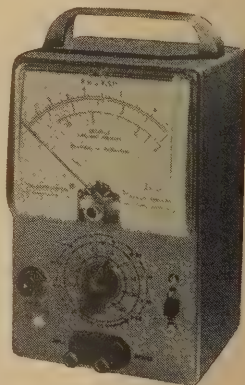


MODEL BT-1  
SHIPPING  
WT. 3 LBS.

\$7.50

## Heathkit AC VACUUM TUBE VOLTMETER KIT

A new AC VTVM that makes possible those sensitive AC measurements required by laboratories, audio enthusiasts and experimenters. Ten full scale ranges of .01, .03, .1, .3, 1, 3, 10, 30, 100 and 300 volts RMS. 10 DB ranges from -52 to +52 DB. Frequency response within 1 DB from 20 cycles to 50 kc. Simpson 200 microampere meter with large plainly marked meter scales. Precision multiplier resistors. Two amplifier stages using miniature tubes. A unique bridge rectifier meter circuit and a clean layout of parts. Order the AV-2 today and become acquainted with the interesting possibilities offered by this instrument.



MODEL AV-2  
SHIPPING  
WT. 5 LBS.

\$29.50

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY 16  
CABLE: ARLAB-N.Y.

The **HEATH COMPANY**

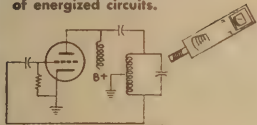
... BENTON HARBOR 20, MICHIGAN



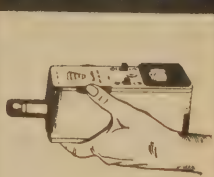
# NEW *Heathkit* GRID DIP METER KIT

• CONVENIENT ONE HAND OPERATION.

Indicates frequency of energized circuits.



Indicates frequency of de-energized tuned circuits.

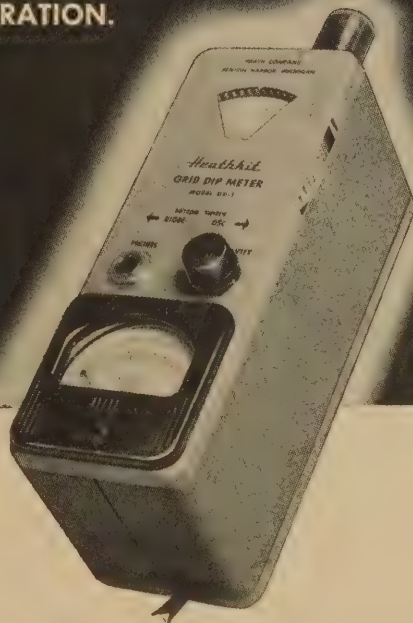


Complete unit easily held and operated with one hand.

MODEL GD-1

SHIPPING  
WT. 4 LBS.

**\$19<sup>50</sup>**



- New GRID DIP METER with assembled calibrated coils.
- Uses quality Simpson 500 microampere meter.
- One hand operation, extremely compact. Only 2½" wide by 3" high by 7" long.
- Variable meter sensitivity control.
- Uses newest type 6AF4 high frequency triode in a Colpitts oscillator circuit.
- Continuous coverage from 2 megacycles to over 250 megacycles in 6 ranges.
- Head phone monitoring jack.
- AC power transformer operated for maximum safety.

Here is the GRID DIP METER KIT you have been asking for. This new HEATHKIT instrument is compact, highly sensitive and easy to use. Housed in a handsome formed aluminum cabinet—rounded corners—durable oven baked finish on panel and cabinet. The entire instrument can be easily held and operated in one hand, tuning accomplished with the thumb wheel drive. This excellent design feature leaves the other hand entirely free for making circuit adjustments. The instrument with many applications—with oscillator energized, use it for finding the resonant frequency of tuned circuits, locating parasitics, determining characteristics of filter circuits, roughly tuning transmitter stages with power off, and neutralizing transmitters. Useful in TV and radio repair work for alignment of traps, filters, IF stages, peaking and compensation networks within the 2 to 250 megacycle range. With the oscillator not energized, the instrument acts as an absorption wave meter and indicates the frequency of radiating power sources. Locates spurious oscillations, as a relative indication of power in various transmitter stages, etc. Phone jack permits monitoring of AM transmitter for determination of radiated hum, audio quality, etc. (Head phones not included). Complete kit includes plug-in coils, tube, all necessary parts and detailed assembly and instruction manual.

## *Heathkit* IMPEDANCE BRIDGE KIT

MODEL 1B-1B

SHIPPING  
WT. 15 LBS.

**\$69<sup>50</sup>**

The HEATHKIT IMPEDANCE BRIDGE is especially useful in educational training programs, industrial laboratories and for experimental work. Use it for measuring AC and DC resistance value of resistors,

determination of condenser capacitance and dissipation factor, finding coil inductance and storage factor, electrical measurements work, etc. Quality components: GR 1000 cycle hummer, GR main control, Mallory ceramic wafer silver plated contact switches, ½% precision resistors, etc. The basic circuit is a self powered, 4 arm bridge. Choice of Wheatstone, Capacitance comparison, Maxwell or Hay bridge circuits. Resistance from 10 milliohm to 10 megohm. Capacitance 10 mmf to 100 mfd. Inductance 10 microhenry to 100 henries. Dissipation factor .002 to 1. Storage factor (Q) 1 to 1000. The IMPEDANCE BRIDGE has provisions for external generator use for measurement at other than the 1000 cycle level. Take the guess work out of electrical measurements. The HEATHKIT IMPEDANCE BRIDGE mounted in a beautiful polished birch cabinet with large easy reading panel calibrations will furnish years of accurate, trouble free measurement service.

## *Heathkit* HANDITESTER KIT

The HEATHKIT Model M-1 HANDITESTER fulfills requirements for a portable volt ohm milliammeter. This kit features precision 1% resistors, 3 deck switch for trouble free mounting of parts, specially designed battery bracket, smooth acting ohms adjust control, beautiful molded bakelite case and a 400 micro-ampere meter movement. 5 convenient AC and DC voltage ranges as follows: 10 - 30 - 300 - 1000 - 5000 volts. Ohms ranges 0 - 3000 and 0 - 300,000. DC milliamperes ranges 0 - 10 milliamperes and 0 - 100 milliamperes. The instrument is easily assembled from complete instructions and pictorial diagrams. Test leads are included. Carry the HEATHKIT M-1 HANDITESTER in your tool box at all times for those simple jobs and eliminate that extra trip for additional testing equipment.



MODEL M-1

SHIPPING  
WT. 3 LBS.

**\$13<sup>50</sup>**

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
12 E. 40th ST.  
NEW YORK CITY (16)  
CABLE: ARLAB-N.Y.

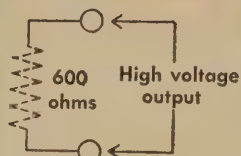
*The* **HEATH COMPANY**

... BENTON HARBOR 20, MICHIGAN



NEW  
*Heathkit***AUDIO GENERATOR KIT**

• RANGE EXTENDED TO 1 MEGACYCLE

**MODEL AG-8**SHIPPING  
WT. 16 LBS.**\$29.50**Low impedance output  
High voltage outputSine wave output  
from 20 cycles to 1  
megacycle.

- Improved design — new low price.

- Frequency coverage in five ranges from 20 cycles per second to 1 megacycle.

- Response flat 1 DB from 20 cycles to 400 kilocycles. Down 3 DB at 600 kilocycles. Down only 8 DB at 1 megacycle.

- Five calibrated output voltage ranges, continuously variable 1 mv, 10 mv, 100 mv, 1 v, 10 v.

- Low impedance output circuit. 600 ohms.

- Distortion less than .4 of 1% from 100 cycles per second through the audible range.

- New HEATHKIT universal type binding posts.

- Durable infra-red baked enamel panel.

- Transformer operated for safe operation.

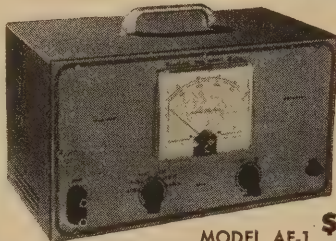
- Sturdy, ventilated steel cabinet.

A new Audio Generator with features heretofore found in only the most expensive generators. Such features as complete coverage from 20 cycles to 1 Mc — response flat  $\pm 1$  db from 20 cycles to 400 Kc, down 3 db at 600 Kc and down only 8 db at 1 Mc.

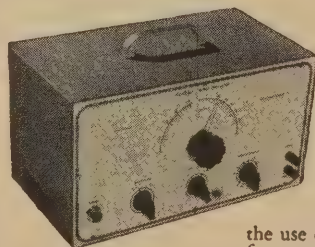
And it has calibrated output... Calibrated continuously variable and step attenuator output controls allow you to easily set calibrated output voltage. Moreover, distortion is less than .4 of 1% from 100 cps through the audible range.

Oscillator section consists of a two stage resistance coupled amplifier (6SJ7 and 6AK6) utilizing both positive and negative feedback for oscillator operation and reduction of distortion. Oscillator section drives a cathode follower output power amplifier (6AK6) which isolates the oscillator from variations in load and presents a low impedance output (600 Ohms). Power supply is transformer operated and utilizes 6X5 rectifier with 2 sections of RC filtering.

An unbeatable dollar value — for here is an audio generator with wide frequency coverage, excellent frequency response, stepped and continuously variable calibrated output, high signal level, low impedance output, and low inherent distortion.

*Heathkit* **AUDIO FREQUENCY METER KIT**

The HEATHKIT AUDIO FREQUENCY METER provides a simple and easy way to check unknown audio frequencies from 10 cycles to 100 kc between 3 and 300 volts RMS. The instrument features 7 ranges for accuracy and wide coverage. The meter itself has a quality 200 microampere Simpson movement and large clearly marked scales. The AUDIO FREQUENCY METER is transformer operated and features a voltage regulator tube to maintain constant plate voltage on the second stage. Kit supplied complete with all necessary construction material and a detailed construction manual.

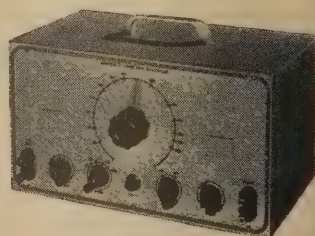
SHIPPING  
WT. 15 LBS.**\$34.50**NEW *Heathkit*  
**AUDIO OSCILLATOR KIT**MODEL AO-1  
SHIPPING  
WT. 14 LBS.**\$24.50**

A new Audio Oscillator with both sine and square wave coverage from 20 to 20,000 cycles... An instrument designed to completely fulfill the needs of the audio engineer and enthusiast — Has numerous advantages such as high level output (up to 10V obtainable across the entire range), distortion less than .6%, and low impedance output.

Special design features include the use of a thermistor in the second amplifier stage for keeping the output essentially flat across the entire range.

A cathode coupled clipper circuit produces good, clean, square waves with rise time of only 2 microseconds. Oscillator section uses 1% precision resistors in range multiplier circuit for greatest accuracy.

You'll like the operation of this fine new kit.

*Heathkit* **SQUARE WAVE GENERATOR KIT**MODEL SQ-1  
SHIPPING  
WT. 14 LBS.**\$29.50**

The HEATHKIT SQUARE WAVE GENERATOR is an excellent square wave frequency source with wide range coverage from 10 cycles to 100 kc continuously variable. This feature makes it useful for TV and wide band amplifier work as well as audio experimentation. The output voltage is continuously variable between 0 and 20 volts. The circuitry consists of a multivibrator stage, a clipping and squaring stage and a cathode follower low impedance output stage. The power supply is transformer operated and utilizes a full wave rectifier circuit with two sections of filtering. Another excellent HEATHKIT value at this remarkable low price. Kit includes all necessary construction material as well as complete instruction manual for assembly and operation.

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY 101  
4011 AREAS

*The* **HEATH COMPANY****... BENTON HARBOR 20, MICHIGAN**

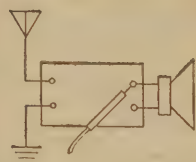


# NEW *Heathkit* VISUAL-AURAL SIGNAL TRACER KIT

• NEW NOISE LOCATOR AND WATTMETER CIRCUITS.



Both visual and aural indications.



Traces signals from antenna clear through speaker.

MODEL T-3

SHIPPING  
WT. 8 LBS.

**\$22<sup>50</sup>**

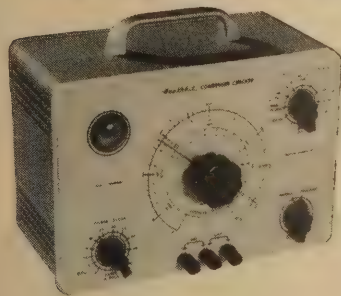


- Permits visual signal observation as well as aural operation.
- Two separate input channels.
- Tremendous RF channel sensitivity. Adequate for actual signal detection at receiver input.
- Separate high gain RF and low gain audio channels.
- A unique and useful noise locator circuit.
- Built-in calibrated wattmeter.
- Two separate shielded probes for RF and audio application.
- Additional test leads supplied.
- Substitution test speaker and output transformer eliminates necessity for speaker removal in service work.
- Utility amplifier. Check record changers, tuners, microphones, instrument pickups, etc.
- VTVM and Scope panel terminals.
- 5 tube transformer operated circuit.

The new HEATHKIT VISUAL AURAL SIGNAL TRACER represents one of the most convenient and useful instruments the service man can use in AM, FM and TV service work.

The electron ray beam indicator constantly monitors both input channels for visual observation of the signal. Now, see and hear the signal level for easier estimation of signal strength and gain per stage in a receiver circuit. Separate high gain channel and special shielded demodulator probe for RF circuit work. Low gain channel for audio circuit investigation and for use as a noise locator. In this feature, approximately 200 volts DC is applied to a suspected circuit component and the action of the voltage in the component can be seen and heard to determine satisfactory operation. This feature alone will prove tremendously helpful in locating the source of objectionable noises in coils, transformers, resistors, condensers, cold solder joints, controls, etc. A convenient wattmeter permits rapid preliminary check for voltage distribution circuit breakdown as well as transformer failures. Use the T-3 as a universal test speaker and substitution transformer and save service time by eliminating the necessity for speaker removal on every service call. Additional service uses are: as a utility amplifier for checking the output of record changers, tuners, microphones, instrument pickups, etc. Separate panel terminals permit utilization of other shop equipment such as your Oscilloscope or VTVM. Entire kit supplied complete with 5 tubes, all necessary construction material along with a detailed step by step instruction manual for the assembly and operation of the instrument.

## NEW *Heathkit* CONDENSER CHECKER KIT



MODEL C-3  
SHIPPING  
WT. 7 LBS.

**\$19<sup>50</sup>**

Announcing the new improved Model C-3 HEATHKIT CONDENSER housed in a new smartly styled professional appearing cabinet featuring rounded corners and snug fitting drawn panel. Adequate provisions for ventilation in-

sure longer instrument life through cooler operation. Use the C-3 to accurately measure those unknown condenser and resistor values. All readings of condensers and resistors are read directly on the calibrated scales. Range of condenser measurements is from .00001 mfd to 1000 mfd. Calibrated resistance measurements can be made from 100 ohms to 5 megohms. A leakage test with a choice of 5 DC polarizing voltages will quickly indicate condenser operating quality under actual voltage load conditions. The spring return leakage test switch automatically discharges the condenser under test and eliminates shock hazard. An electron ray beam indicator tube is used in a new leakage test circuit for added sensitivity. The instrument is transformer operated for safety and will prove an extremely welcome addition to your shop equipment. The kit is furnished complete with all necessary parts, test leads and includes a step by step detailed construction manual for assembly and operation.

## *Heathkit* TV ALIGNMENT GENERATOR KIT

MODEL TS-2  
SHIPPING  
WT. 20 LBS.

**\$39<sup>50</sup>**



Here is an excellent TV ALIGNMENT GENERATOR designed to do TV service work quickly, easily and properly. The Model TS-2 when used in conjunction with an Oscilloscope provides a means of correctly aligning TV receivers. The instrument furnishes a frequency modulated signal covering in 2 bands the range of 10 to 90 megacycles and 150 to 230 megacycles. An absorption type frequency marker covers from 20 to 75 megacycles in 2 ranges; therefore you have a simple, convenient means of checking IF's independent of oscillator calibration. Sweep width is variable from 0 to 12 megacycles. Other excellent features are horizontal sweep voltage controlled with a phasing control — both step and continuously variable attenuation for setting the output signal to the desired level — a convenient stand by switch — and blanking for establishing a single trace with a base reference level. Make your work easier, save time and repair with confidence. Order your HEATHKIT TV ALIGNMENT GENERATOR now.

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY 10  
CABLE: APLAB N. Y.

*The* **HEATH COMPANY**

... BENTON HARBOR 20, MICHIGAN

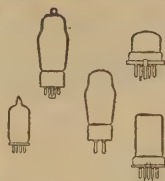
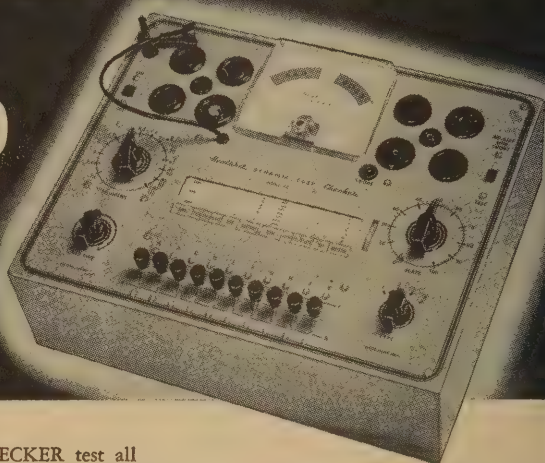


# Heathkit TUBE CHECKER KIT

MODEL TC-1

SHIPPING  
WT. 12 LBS.

**\$29.50**



Checks 7, 8, 9 prong tubes, octals, localts, 7 and 9 prong miniatures, 5 prong Hytrons, pilot lights.



Checks for opens, shorts, emission, filament and filament tap continuity.

- Beautiful counter type birch cabinet.
- 4½" Simpson 3 color meter.
- Simplified setup procedure.
- Built-in gear driven roll chart.
- Checks emission, shorted elements, open elements and continuity.
- Complete protection against obsolescence.
- Sockets for every modern tube.
- Blank for new types.
- Individual element switches.
- Contact type pilot light test socket.
- Line adjust control.

## PORTABLE TUBE CHECKER KIT MODEL TC-1P

Same as TC-1 except supplied with polished birch cabinet (with removable lid) instead of counter type cabinet. Shipping weight 14 lbs.....

**\$34.50**

No. 365 Polished Birch Tube Checker Cabinet only. Shipping Weight 7 lbs.....

**\$7.50**

With the HEATHKIT TC-1 TUBE CHECKER test all types of tubes commonly encountered in AM-FM and TV receiver circuits. Test setup procedure is simplified, rapid and flexible. Tube quality is read directly on a beautiful 4½" Simpson three color BAD - ? - GOOD scale that your customers can readily understand. Panel sockets accommodate 4, 5, 6 and 7 prong tubes, octals, localts, 7 and 9 prong miniatures, 5 prong Hytrons, a blank socket for new tubes and a contact type socket for quick checking of pilot lights. Built-in gear driven roll chart for instant reference. Neon short indicator, individual three position lever switch for each tube element, spring return test switch, line set control to compensate for supply voltage variations. At this low price, no service man need be without the advantages offered by the HEATHKIT TUBE CHECKER.

## Heathkit TV PICTURE TUBE TEST ADAPTER

Use your HEATHKIT TUBE CHECKER with this new TV TEST ADAPTER to determine picture tube quality. Check for emission and shorts, independent of TV power supply. Consists of standard 12 pin TV tube socket, 4 feet of cable, octal socket connector and data sheet. Quickly prove TV picture tube condition to yourself and your customer.

No. 355  
Ship. Wt. **\$4.50**  
1 lb.

## Heathkit RESISTANCE SUBSTITUTION BOX KIT

MODEL RS-1  
SHIPPING  
WT. 3 LBS.

**\$5.50**

NEW HEATHKIT RESISTANCE SUBSTITUTION BOX KIT provides switch selection of any single one of 36 RTMA 1 watt 10% standard value resistors, ranging from 15 ohms to 10 megohms. This coverage available in 2 ranges in decades of 15, 22, 33, 47, 68 and 100. Housed in rugged plastic cabinet featuring new HEATHKIT universal type binding posts. The entire kit priced less than the retail value of the resistors alone.

## Heathkit BATTERY ELIMINATOR KIT

A clean 6 volt d-c supply source is definitely required for successful automobile radio servicing. Has a continuously variable d-c output from 0 to 8 volts. It can be safely operated at a steady 10 ampere level and will deliver up to 15 amperes for intermittent periods. The voltage output terminals are completely isolated from the chassis to accommodate additional service applications such as supplying bias voltages or d-c substitution voltages for battery operated tube filament circuits.

The output of the Battery Eliminator is constantly monitored by a d-c voltmeter and a d-c ammeter. The circuit features an automatic overload relay of self resetting type. For additional protection, a panel mounting fuse is provided. Build this kit in a few hours and pocket a substantial savings.

MODEL BE-3  
SHIPPING  
WT. 20 LBS.

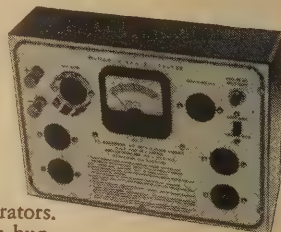
**\$24.50**

## Heathkit VIBRATOR TESTER KIT

Repair time is valuable, and the Heathkit Vibrator Tester will save you hours of work. Instantly tells the condition of the vibrator under test—and the check is thorough and complete. Checks vibrator for proper starting, and the easy-to-read meter indicates the quality of output on large BAD-GOOD scales. Tests both interrupter and selfrectifier types of vibrators. Five different sockets for checking hundreds of vibrators.

Operates from any battery eliminator capable of delivering continuously variable voltage from 4-6V at 4 amps. The Heathkit BE-3 Battery Eliminator is ideal for operating this kit.

Faulty vibrators can be spotted within seconds and you're free to go on to other service jobs.

MODEL VT-1  
SHIPPING  
WT. 7 LBS.

**\$14.50**

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
12 E. 40th ST.  
NEW YORK CITY 16  
CABLE: ARLAB-N.Y.

# The HEATH COMPANY

... BENTON HARBOR 20, MICHIGAN

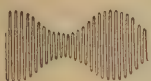


# Heathkit SIGNAL GENERATOR KIT

MODEL SG-7

SHIPPING  
WT. 7 LBS.

**\$19<sup>50</sup>**



Modulated or unmodulated RF output.



400 cycle sine wave output.

- Step attenuated RF output.
- 6 to 1 vernier dial ratio.
- Turret mounted coil sub-assembly.
- Pre-calibrated and adjusted coils.
- Hartley RF oscillator circuit.
- Colpitts oscillator 400 cycle sine wave output.
- Modulated or unmodulated RF output.
- Frequency coverage on fundamentals 160 kc to 50 megacycles in five ranges. 51 megacycles to 150 megacycles on calibrated harmonics.
- RF output in excess of 100,000 microvolts.
- Audio output 1½ to 2 volts.
- AC transformer operated.
- Professionally styled cabinet.
- Infra red baked enamel panel.

The new HEATHKIT Model SG-7 SIGNAL GENERATOR easily fulfills requirements for a controllable, modulated or unmodulated source of variable frequency. A convenient 400 cycle sine wave output is available for audio work. All RF oscillator coils are precision wound and adjusted to calibration before shipment thereby assuring maximum accuracy. The coils, band switch and tuning condenser all mount as a turret assembly so as to offer the advantage of short wiring leads and easy mounting of parts. The RF output circuit is of the low impedance type obtained by the use of cathode coupling to the output jacks. The level of RF output is varied by means of the RF step and RF output control. Use the HEATHKIT SG-7 as an RF signal source modulated or unmodulated for radio repair, laboratory work, experimental testing, 400 cycle sine wave audio testing, checking RF stages, alignment of both AM and FM IF stages, marker generator for TV alignment, etc. The kit is transformer operated and utilizes miniature tubes for ease in handling high frequency. Panel jacks and a convenient switching system permit either external or internal modulation. The entire kit is supplied complete with tubes and all necessary material as well as a detailed step by step instruction manual for the assembly and operation of the instrument.

## Heathkit INTERMODULATION ANALYZER KIT



MODEL IM-1  
SHIPPING WT. 18 LBS.

**\$39<sup>50</sup>**

The HEATHKIT MODEL IM-1 is an extremely versatile instrument specifically designed for measuring the degree of interaction between two

signals caused by a specific piece of apparatus, or a chain of equipment. It is primarily intended for tests of audio equipment but may be used in other applications such as making tests of microphones, records, recording equipment, phonograph pickups and loud speakers. Use it for checking tape or disc recordings, as a sensitive AC voltmeter, as a high pass noise meter for adjusting tape bias, cutting needle pitch or other applications. High and low test frequency source, intermodulation section, power supply and AC voltmeter all in one complete unit. Percent intermodulation is directly read on three calibrated ranges, 30%, 10% and 3% full scale. Both 4 to 1 and 1 to 1 ratios of low to high frequencies easily set up. At this low kit price YOU can enjoy the benefits of Intermodulation analysis for accurate audio interpretations.

## Heathkit LABORATORY REGULATED POWER SUPPLY KIT



MODEL PS-2  
SHIPPING WT. 20 LBS.

**\$29<sup>50</sup>**

New HEATHKIT LABORATORY POWER SUPPLY provides continuously variable regulated DC voltage output from 160 volts to 400 volts depending on load. Panel terminals supply separate 6.3 V. AC supply at 4 amperes for filament circuits. A 3½" plastic cased panel mounted meter provides accurate metered output for either voltage of current measurements. Exceptionally low ripple content of .012% admirably qualifies the HEATHKIT LABORATORY POWER SUPPLY for high gain audio applications. Ideal for laboratory work requiring a reference voltage for meter calibration or for plotting tube characteristics. In service work, it can be used as a separate variable voltage supply to determine the desirable operating voltage in a specific circuit. Use it as a DC substitution voltage in trouble shooting TV circuits exhibiting symptoms of extraneous undesirable components in plate supply circuits. Entire kit, including all 5 tubes now available at this low price.

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
12 E. 40th ST.  
NEW YORK CITY (16)  
CABLE ARLAB N.Y.

*The* **HEATH COMPANY**

... BENTON HARBOR 20, MICHIGAN



# Heathkit WILLIAMSON TYPE AMPLIFIER KIT

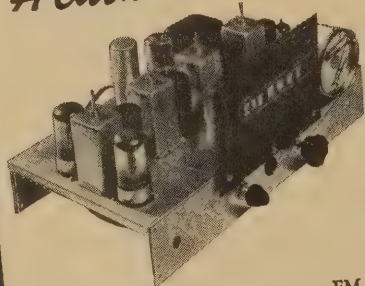
The new HEATHKIT WILLIAMSON TYPE AMPLIFIER incorporates the latest improvements described in Audio Engineering's "Gilding the Lily." 5881 output tubes and a new Peerless output transformer with additional primary taps afford peak power output of well over 20 watts. Frequency response  $\pm 1$  db from 10 cycles to 100 kc. allows reproduction of highs and lows with equal crispness and clarity. Harmonic and intermodulation distortion have been reduced to less than  $\frac{1}{2}$  of 1% at 5 watts. This eliminates the harsh unpleasant qualities which contribute to listening fatigue. Make this amplifier the heart of your radio system to achieve the fine reproduction that is the goal of all music lovers.

The HEATHKIT PREAMPLIFIER (available separately or in combination with the amplifier kit) features inputs for magnetic or low level cartridges, crystal pickups and tuners, turnover control for LP or 78 type records, individual bass and treble tone controls each providing up to 15 DB of boost or attenuation. Special notched shafts on preamplifier controls and switches adaptable to custom installation. The preamplifier can be mounted in any position and a liberal length of connecting cable is supplied. No radio experience is required to construct this amplifier. All punching, forming, or drilling has already been done. The complete kit includes all necessary parts as well as a detailed step by step construction manual with pictorial diagrams to greatly simplify the construction.

**ACROSOUND TRANSFORMER OPTION.** If desired, the output transformer with the kit will be the Acrosound output transformer, type TO-300. The use of this transformer permits ultra-linear operation as described in Audio Engineering's "Ultra-Linear Operation of the Williamson Amplifier."



## Heathkit FM TUNER KIT



MODEL FM-2  
SHIPPING  
WT. 9 LBS.

**\$22<sup>50</sup>**

The HEATHKIT MODEL FM-2 TUNER specifically designed for simplified kit construction features a preassembled and adjusted tuning unit. Three double tuned IF transformers and a discriminator transformer are used in an 8 tube circuit. Smooth tuning is obtained through a 9 to 1 ratio vernier drive using a calibrated six inch slide rule type dial. The usual frequency coverage of 88 to 108 megacycles is provided. Experience the thrill of building your own FM tuner. Operate it through your amplifier or radio and enjoy all the advantages of true FM reception. Transformer operated power supply to simplify connections to all types of audio systems. The kit is supplied complete with all 8 tubes and a necessary material required for construction. A complete instruction manual simplifies assembly and operation.

### PRICES OF VARIOUS COMBINATIONS

<b>W-2 Amplifier Kit</b> (Incl. Main Amplifier with Peerless Output Transformer, Power Supply and WA-P1 Preamplifier Kit) Shipping Weight 39 lbs.	<b>\$69<sup>50</sup></b>
<b>W-2M Amplifier Kit</b> (Incl. Main Amplifier with Peerless Output Transformer and Power Supply) Shipping Weight 29 lbs. Shipped express only	<b>\$49<sup>75</sup></b>
<b>W-3 Amplifier Kit</b> (Incl. Main Amplifier with Acrosound Output Transformer, Power Supply and WA-P1 Preamplifier Kit) Shipping Weight 39 lbs. Shipped express only	<b>\$69<sup>50</sup></b>
<b>W-3M Amplifier Kit</b> (Incl. Main Amplifier with Acrosound Output Transformer and Power Supply) Shipping Weight 29 lbs. Shipped express only	<b>\$49<sup>75</sup></b>
<b>WA-P1 Preamplifier Kit only.</b> Shipping Weight 7 lbs. Shipped express or parcel post.	<b>\$19<sup>75</sup></b>

## Heathkit ECONOMY 6 WATT AMPLIFIER KIT



MODEL A-7  
SHIPPING  
WT. 10 LBS.

**\$14<sup>50</sup>**

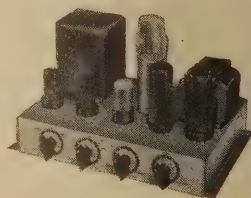
The HEATHKIT Model A-7 amplifier features beam power, push pull output with frequency response flat  $\pm 1\frac{1}{2}$  DB from 20 to 20,000 cycles. Separate volume, bass and treble controls. Two input circuits, output impedances of 4, 8, and 15 ohms. Peak power output rated at full 6 watts. High quality components, simplified layout, attractive gray finished chassis, break off type adjustable length control shafts and attractive lettered control panel.

THE MODEL A7A amplifier incorporates a preamplifier stage with special compensated network to provide the necessary voltage gain for operation with variable reluctance or low output level phono cartridges. Excellent gain for microphone operation in a moderate powered sound system.....**\$16.50**

## Heathkit HIGH FIDELITY 20 WATT AMPLIFIER KIT

The HEATHKIT MODEL A-8 amplifier kit was designed to deliver high fidelity performance with adequate power output at moderate cost. The frequency response is within  $\pm 1$  DB from 20 to 20,000 cycles. Distortion at 3 DB below maximum power output at 1000 cycles is only .8%. The amplifier features a Chicago power transformer in a drawn steel case and a Peerless output transformer with output impedances of 4, 8, and 16 ohms available. Separate bass and treble tone controls permit wide range of tonal adjustment to meet the requirements of the most discerning listener. The amplifier uses a 6SJ7 voltage amplifier, a 6SN7 amplifier and phase splitter and two 6L6's in push pull output and a 5U4G rectifier. Two input jacks for either crystal or tuner operation. The kit includes all necessary material as well as a detailed step by step construction manual.

MODEL A8-A features an added 6SJ7 stage (preamplifier) for operating from a variable reluctance cartridge or other low output level phono pickups. Can also be used with a microphone. A 3 position panel switch affords the desired input service. ....**\$35.50**



MODEL A-8  
SHIPPING WT. 19 LBS.

**\$33<sup>50</sup>**

EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY 103  
CABLE: ARAB-N.Y.

**The HEATH COMPANY**

... BENTON HARBOR 20, MICHIGAN



# Heathkit SUPERHETERODYNE RECEIVER KITS

- High gain dual iron core tuned type IF transformers
- AC transformer operation for safety
- Continuously variable tone control
- Sturdy punched and plated steel chassis
- Ideal for custom installation
- Full AVC action
- Inverse feedback for improved frequency response
- Kit supplied with all necessary construction material except speaker and cabinet. (Available separately if desired).

6 tube all wave circuit.  
3 ranges, continuous coverage 550 kc to over 20 megacycles, shipping wt. 11 lbs.

Model AR-1

**\$23.50**



5 tube broadcast band  
550 to 1600 kc coverage,  
shipping wt. 11 lbs.

Model BR-1

**\$19.50**



Two excellent radio receiver kits featuring clean design and open layout for simplified construction. Satisfy that urge to build your own radio receiver and select the model which meets your requirements. Both receivers feature continuously variable tone control, a radio phono switch and phono input and an AC receptacle for the phono motor. A six inch calibrated slide rule type dial with a 9 to 1 ratio vernier dial drive insures easy tuning.

## SHIPPING INFORMATION

ON PARCEL POST ORDERS include postage for weight shown and insurance. (We insure all shipments.) Don't worry about sending more than the correct amount — if you send us too much, every extra cent will be promptly returned.

ON EXPRESS ORDERS do not include transportation charges. They will be collected by Express Agency on delivery.

ORDERS FROM CANADA must include full remittance for merchandise.

Orders processed on the same day received. Customers notified of unavoidable delay.

U. S. postal or express money orders, bank drafts or checks are acceptable. Do not send loose coins or stamps.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

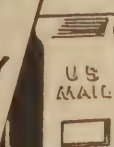
EXPORT AGENT  
ROCKE INTERNATIONAL CORP.  
13 E. 40th ST.  
NEW YORK CITY (16)  
CABLE: ARLAB N.Y.

# The HEATH COMPANY

... BENTON HARBOR 20, MICHIGAN

## ORDER BLANK

MAIL YOUR ORDER  
TODAY TO THE  
**HEATH COMPANY**  
BENTON HARBOR 20,  
MICHIGAN



From \_\_\_\_\_

### SHIP VIA

- ☐ Parcel Post  
☐ Express  
☐ Freight  
☐ Best Way

(PLEASE PRINT)

QUANTITY	ITEM	PRICE	QUANTITY	ITEM	PRICE
	Heathkit Oscilloscope Kit—Model O-8 (29 lbs.)	\$43.50		Heathkit Square Wave Gen. Kit—Model SQ-1 (14 lbs.)	\$29.50
	Heathkit Intensifier Kit (O-8 only) No. 339 (1 lb.)	7.50		Heathkit AC VTVM Kit—Model AV-2 (5 lbs.)	29.50
	Heathkit Voltage Calibrator Kit—Model VC-1 (5 lbs.)	9.50		Heathkit Intermodulation Analyzer Kit—Model IM-1 (18 lbs.)	39.50
	Heathkit Electronic Switch Kit—Model S-2 (11 lbs.)	19.50		Heathkit Regulated Power Supply Kit—Model PS-2 (20 lbs.)	29.50
	Heathkit Scope Demodulator Probe Kit No. 337 (1 lb.)	4.50		Heathkit Handitester Kit—Model M-1 (3 lbs.)	13.50
	Heathkit T.V. Alignment Generator Kit—Model TS-2 (20 lbs.)	39.50		Heathkit Decade Resistance Kit—Model DR-1 (4 lbs.)	19.50
	Heathkit Q Meter Kit—Model QM-1 (12 lbs.)	39.50		Heathkit Decade Condenser Kit—Model DC-1 (4 lbs.)	16.50
	Heathkit Grid Dip Meter Kit—Model GD-1 (4 lbs.)	19.50		Heathkit Impedance Bridge Kit—Model IB-1B (15 lbs.)	69.50
	Heathkit VTVM Kit—Model V-6 (7 lbs.)	24.50		Heathkit Battery Tester Kit—Model BT-1 (3 lbs.)	7.50
	Heathkit RF Probe Kit No. 309 (1 lb.)	5.50		Heathkit Resistance Substitution Box Kit—Model RS-1 (3 lbs.)	5.50
	Heathkit HV Probe Kit No. 336 (2 lbs.)	5.50		Heathkit F.M. Tuner Kit—Model FM-2 (9 lbs.)	22.50
	Heathkit Peak-to-Peak Volt. Probe Kit No. 338 (2 lbs.)	6.50		Heathkit Broadcast Receiver Kit—Model BR-1 (11 lbs.)	19.50
	Heathkit Visual-Aural Signal Tracer Kit—Model T-3 (8 lbs.)	22.50		Heathkit Three Band Receiver Kit—Model AR-1 (11 lbs.)	23.50
	Heathkit Condenser Checker Kit—Model C-3 (7 lbs.)	19.50		Heathkit Amplifier Kit—Model A-7 (10 lbs.)	14.50
	Heathkit RF Signal Generator Kit—Model SG-7 (7 lbs.)	19.50		Heathkit Amplifier Kit—Model A-7A (10 lbs.)	16.50
	Heathkit Tube Checker Kit—Model TC-1 (12 lbs.)	29.50		Heathkit Amplifier Kit—Model A-8 (19 lbs.)	33.50
	Heathkit T.V. Tube Adapter No. 355 (1 lb.)	4.50		Heathkit Amplifier Kit—Model A-8A (19 lbs.)	35.50
	Heathkit Battery Eliminator Kit—Model BE-3 (20 lbs.)	24.50		Williamson Type Amplifier Kit (Type: )	
	Heathkit Vibrator Tester Kit—Model VT-1 (7 lbs.)	14.50		Shipped express only	
	Heathkit Audio Generator Kit—Model AG-8 (16 lbs.)	29.50		WA-PL Preamplifier Kit (7 lbs.) (Shipped exp. or p.p.)	19.75
	Heathkit Audio Oscillator Kit—Model AO-1 (14 lbs.)	24.50			
	Heathkit Audio Frequency Meter Kit—Model AF-1 (15 lbs.)	34.50			

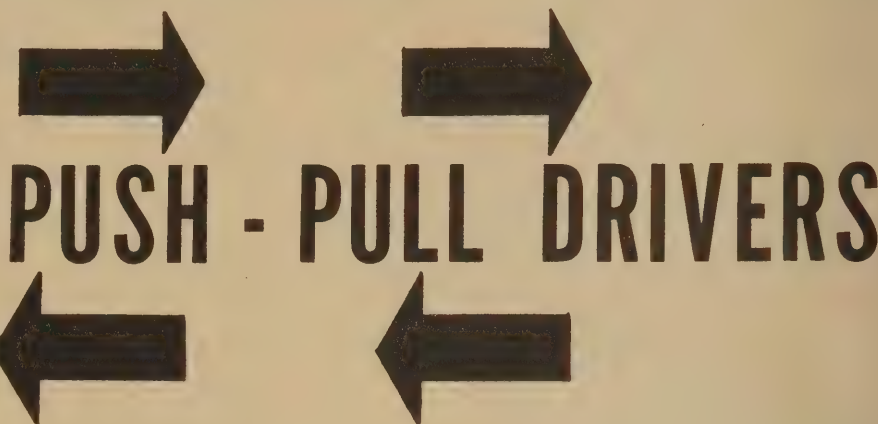
\*Please ship C.O.D. ☐ Postage enclosed for \_\_\_\_\_ lbs.

Enclosed find ☐ Check ☐ Money Order for \_\_\_\_\_



## Part II

A driver circuit  
which preserves  
its balance with  
age or changing  
tube constants



# PUSH - PULL DRIVERS

By GEORGE FLETCHER COOPER

THE previous article indicated how important it was to preserve an accurate balance in the push-pull stages of an amplifier and described some of the phase splitters which are used, but which fail to guarantee the needed permanent balance. There are two basic ways to solve the problem. One of these will be the subject of this article.

The best way to produce two equal voltages with opposite phases is to pass a current through two equal resistors in series. If we use the simple equivalent for a tube we have the arrangement shown in Fig. 1. We can match the resistances as closely as we like, and obtain virtually perfect balance. Most of our problems will arise from the difficulty of achieving this ideal circuit when we must add the supply voltages and input for the tube. So long as we are concerned only with the ideal case we can see that the tube load is  $2R$ , which should be equal to the optimum load given in the tube characteristics, and the gain of the stage to each push-pull grid is:

$$\frac{\mu R}{R_p + 2R}$$

or half the gain for a single-ended load of  $2R$ .

Now let us consider the practical applications of the circuit. Terminal G must be grounded, because that is what the push-pull stage demands. The practical circuit must therefore look something like Fig. 2-a. This, of course, is still a rather theoretical circuit, because the grid of the tube is floating about in mid-air: we proceed to fix the working point of the tube by adding the components  $R_g$ ,  $R_k$  and  $C_k$  (Fig. 2-b). These are the standard components for the tube.  $R_k$  sets the tube to its correct bias,  $C_k$  eliminates the negative feedback caused by  $R_k$  at all frequencies for which  $2\pi f C_k R_k \gg 1$  and  $R_g$  is the usual grid resistor, which normally

must not exceed about 500 kilohms for tubes operated with cathode bias.

We can apply the input signal between X and Y, provided that the source has no ground on it. For practical purposes this implies the use of an input transformer, giving the circuit shown in Fig. 3, which now includes a decoupling resistor  $R_s$  in the supply lead. We can draw the exact equivalent circuit for this arrangement in two different ways, depending on whether we are interested in the low-frequency or the high-frequency end of the response. For the low-frequency end we have Fig. 4.

### What happens in the circuit

The general form of Ohm's law— $I=E/Z$ —can be applied to this circuit fairly easily, though the expressions are rather long because they contain nine variables. We can see by straightforward reasoning what will happen, however. At low frequencies  $C_k$  will no longer act to decouple the cathode resistor  $R_k$ , so that the gain will fall in just the way I described in one of the early articles on Audio Feedback Design. As we usually take a cathode resistor approximately equal to  $R_p/\mu$  the gain will fall by about 4-6 db if we use a triode, or 6 db if we use a pentode. This drop applies to the current round the loop, and affects both the push-pull outputs equally: it does not affect the balance of the outputs at all. Notice, however, that this is because we took output B from the top of  $R_{L2}$ , not from the cathode of the tube. By taking output B from the cathode we will add a new effect, because as the current drops, due to the feedback, the impedance across which the voltage is taken rises, so that the output voltage at B will not drop as much as it does at A.

In the other half of the push-pull drive, the current flows through  $R_{L1}$  and the parallel combination of  $R_s$  and

$C_s$ . The impedance thus rises from  $R_{L1}$  to  $(R_{L1} + R_s)$ , giving, if the current were constant, a rise in response of  $20 \times \log (1 + R_s/R_{L1})$  db. This rise in response is not balanced by anything which happens in the  $R_{L2}$  circuit, so that at very low frequencies we have an unbalance of about  $R_s/R_{L1}$ . This calculation applies fairly well to a pentode, but the unbalance is not so great with a triode, because of the effect of the finite tube impedance.

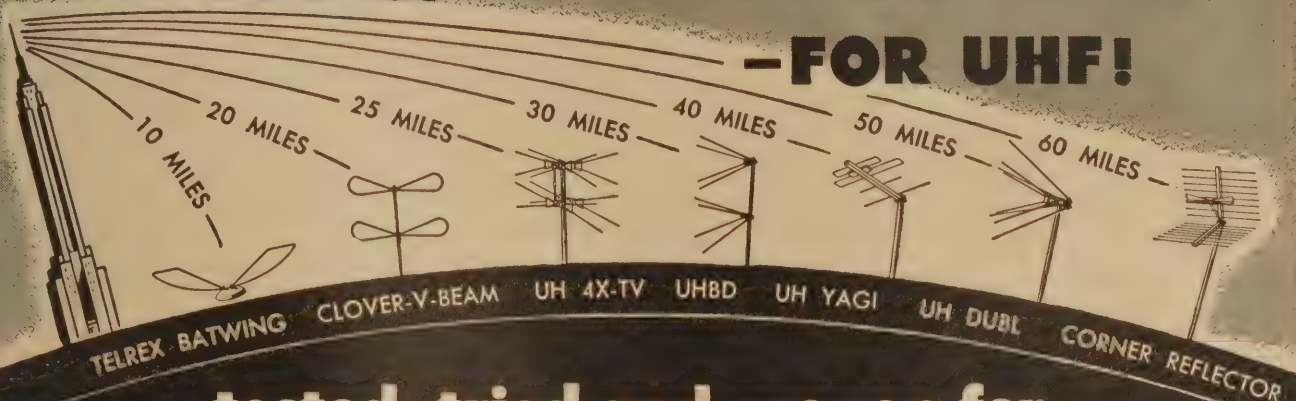
It is attractive to suggest that we should take  $R_k = R_s$  and  $C_k = C_s$ , and derive output B from the cathode. Then the circuit would stay balanced right down to the lowest frequencies. Can we do this? The answer is no. A typical value of  $R_k$  will be 500 ohms (or 470 if you stick to preferred numbers, which make arithmetic so tedious), and  $C_k$  can be 100. This gives us  $\omega C_k R_k = 1$  if  $\omega = 20$  (using  $\omega$  to denote  $2\pi f$ ). The characteristic frequency is about 3 cycles per second. We could use an electrolytic capacitor of 100  $\mu f$  for  $C_s$ , but it is bulky and expensive: we are much more likely to use a 1- $\mu f$  capacitor with  $R_s = 5-10$  kilohms. Remember why we insert this decoupling circuit. We decouple tubes because the plate supply unit has a finite impedance, and the current drawn by one tube affects the voltage supplied to another. This finite supply-unit impedance, with its current fluctuations, is in series with  $R_s$ , so our elegant calculations on this single stage are vitiated by the external circumstances. We must just decouple cathode and plate efficiently.

At high frequencies the circuit takes the form shown in Fig. 5.  $C_1$  and  $C_2$  are the capacitances of the following push-pull stage, and will be equal;  $C_3$  is the capacitance from the bottom of the input-transformer secondary to ground, together with the cathode-heater capacitance of the tube. In addition to these there is the important



# It's *Telrex* across the nation

## -FOR UHF!



**-tested, tried and proven for every reception area, near or far!**

You can depend on Telrex for all your UHF antenna requirements. The same sterling-quality construction featured in VHF models combined with reliable factory ratings assure antenna satisfaction of every UHF installation. The complete Telrex line for UHF

includes famous Conical-V-Beams, Fishbones, Yagis and Bat Wings. There's a Telrex UHF antenna for every area—city, suburban or remote-from-transmitter. When you think of UHF or VHF—think of Telrex!

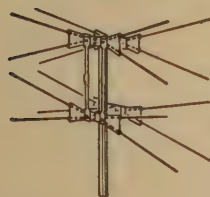


### Bat Wing Model

FOR UHF AND VHF

RANGE—FROM 5 TO 10 MILES

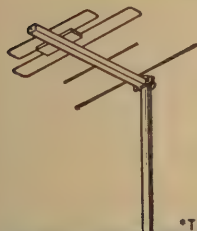
### Model UH 4X-TV



FOR UHF ONLY

RANGE—FROM 15 TO 25 MILES

### UH Duplex Yagi



FOR UHF ONLY

RANGE—FROM 10 TO 40 MILES

\*TRADEMARK REGISTERED

## Telrex

### HURRICANE-BUILT to survive bad weather!

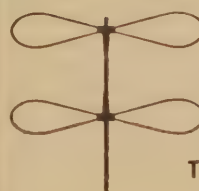
Weather durable materials and superb workmanship continue to make every genuine Telrex antenna super dependable under all climatic extremes. You can be sure of your antenna installation, if it's a Telrex!

"CONICAL-V-BEAMS" are covered

by Patent No. 23,346

CANADIAN and FOREIGN PATENTS PENDING

### Clover-V-Beam



UHF AND VHF ANTENNA

RANGE—FROM 10 TO 20 MILES

### Model UHBD

UHF AND VHF SERVICE

RANGE—FROM 10 TO 30 MILES



### UH DUBL Conical-V-Beam



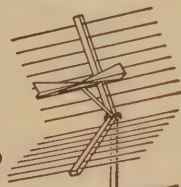
FOR BOTH UHF AND VHF

RANGE—FROM 10 TO 50 MILES

### Corner Reflector

UHF SERVICE ONLY

RANGE—FROM 10 TO 60 MILES



WRITE FOR CATALOGS ON UHF, VHF AND FM ANTENNAS, NOW! New illustrated literature contains complete specifications and technical data in addition to installation hints. Call or write Telrex today!

**Telrex INC.**  
CONICAL-V-BEAMS\*

AMERICA'S STANDARD OF COMPARISON

Originators and Manufacturers of "CONICAL-V-BEAMS"  
—Insist on—  
**Telrex**  
the Original!

ASBURY PARK 9, N. J.



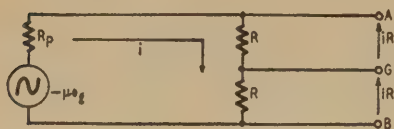


Fig. 1—The best type of phase splitter, shown above, is simply two resistors with their junction grounded. The voltages have to be equal and opposite as long as the two resistors maintain their equal resistance. This circuit also has some practical applications.

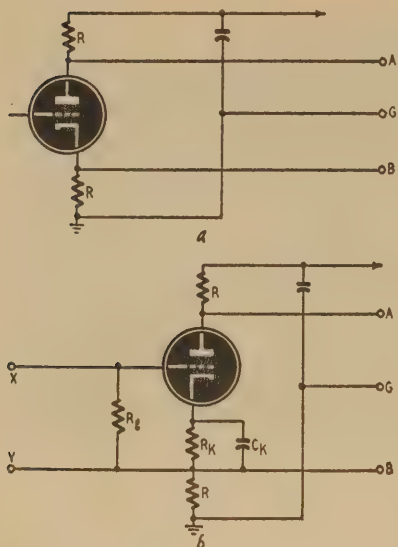


Fig. 2—Two steps toward making a more practical circuit from the one shown in Fig. 1 above. A tube is inserted between the two resistors to supply the necessary current through them and to modulate that current as desired.

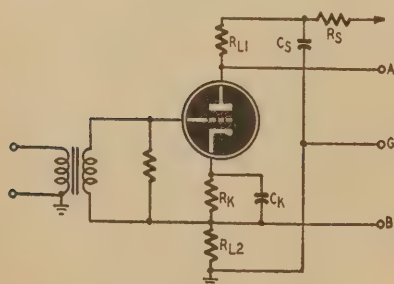


Fig. 3—A practical form of the circuit. Transformer input solves problems of providing a grid return path and of balancing the input to ground.

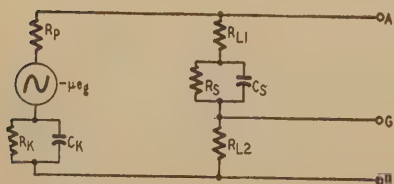


Fig. 4—How the circuit of Fig. 3 appears to low audio-frequency signals.

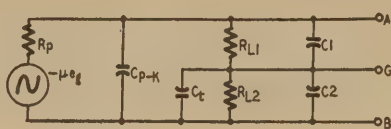


Fig. 5—This is the equivalent circuit of Fig. 3 for signals at the high end.

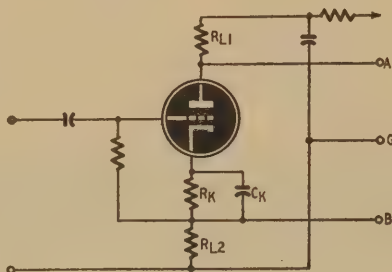


Fig. 6—By grounding one side of the input and using a blocking capacitor, we can abandon the unpopular transformer input. This reduces the gain because of degenerative cathode feedback.

plate-grid capacitance, which provides a "Miller" capacitance in parallel with that of the grid and cathode and affects the overall frequency response. It does not have any effect on the balance, however, so we need not discuss it here. We can concentrate our attention on the unbalance effect produced by the capacitor  $C_{gk}$ .

We can get an idea of what this capacitance will do by putting in some numbers. Typical values of  $R_{L1}$  and  $R_{L2}$  will be 50 kilohms, so that for a top frequency of 16,000 cycles, a capacitance of 200  $\mu\text{mf}$  will be tolerable, from the frequency-response point of view. If feedback is being applied round this stage, the phase shift will be an embarrassment, but in any event we shall be using a modification which eliminates some of this capacitance.

### The practical applications

We very rarely want to use an input transformer, and the reader may ask why we have spent so long considering this circuit, which in spite of its very good balance presents difficulties in connecting the input. The answer is that we can apply our analysis to other arrangements which have a grounded input. Knowing that we have a good arrangement so far as the push-pull character is concerned, we can press on to an examination of other input circuits, without having to worry about the output circuit.

Fig. 6 is a conventional arrangement, in which a blocking capacitor has been added in series with the grid circuit. So far as B is concerned, this stage is just a cathode follower and since  $R_{L2}$  is large there will be slightly less than unity gain from the input to output B. As we have already shown, the phase-splitter is well balanced, so that in this form we need to apply to the input just about the same voltage as each of our final push-pull tubes will require. We can omit  $C_K$  because

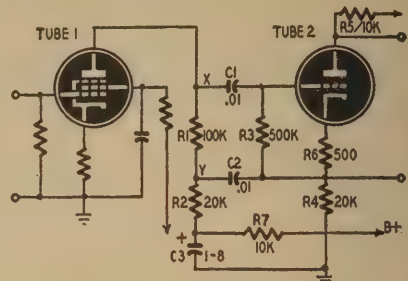


Fig. 7—This more refined circuit overcomes the reduced gain by taking advantage of the cathode-follower circuit's high input impedance. By using a pentode in the first stage, the combined gain of the two stages is excellent.

we have already so much feedback from  $R_{L2}$  that a little extra will not make any difference.

### Two important problems

Before adding some notes on the design of this circuit, two matters have to be discussed. The cathode of the tube is suspended, like Mahomet's coffin, between heaven and earth. Usually it will be at least 50 volts above ground, and we must take care not to let it exceed the maximum voltage given by the tube maker, which is often 90 volts. When a separate heater winding can be provided for this tube there is no problem at all, but I prefer to moor my heater center-point to a +20-volt point obtained by tapping with high resistors across the plate supply. This not only helps to reduce the heater-cathode voltage in this phase-splitter stage, but also reduces the hum in earlier stages of the amplifier.

The second point becomes important only in advanced feedback circuits, or if the following tubes draw grid current. At B, the apparent generator impedance is that of a cathode follower, and is low; at A, the impedance is that of a tube with a great deal of current feedback, and is very high.

The design conditions are fairly easily studied. We take our selected tube, say one-half of a 12AT7, and choose the bias resistor, 500 ohms, and the plate load, say 50 kilohms. This 50 kilohms we split in two, giving 25,000 ohms for each of the resistors  $R_{L1}$  and  $R_{L2}$ .

Applying this load line to the tube characteristics with a supply of 250 volts we get a current of 3-4 ma, and a bias of 1.5-2 volts. The cathode is then between +75 and +100 v, and the stage gain will be

$$\frac{\mu R_{L1}}{R_p + (\mu + 1) R_{L2}} = \frac{40 \times 2,500}{15,000 + (41 \times 25,000)} \approx 0.98$$



**It's New! It's Better! Here's Proof!**

Now, we have finally found the answer in your V8 antenna. Servicemen tell us its the best antenna we have ever had. It really does the job because it pulls in stations we could not get before.

**Here's How**  
**the new RADIART**  
 TELEVISION  
**V\*8 ANTENNA**  
**Solved Mr. Hartong's**  
**Fringe Area Headaches**

*B*urroughs  
 TELEPHONE 5-0273

*R*adio, inc.  
 711 SECOND STREET, NW CANTON 3, OHIO

DISTRIBUTORS OF  
 ELECTRONIC EQUIPMENT  
 WHOLESALE ONLY

October 7, 1952

Mr. William Schoneberger  
 Jobber Sales Manager  
 Radiart Corporation  
 3455 Vega Avenue  
 Cleveland, Ohio

Dear Bill,

Just a word to let you know how we feel about your new V8 antenna.

As you know, our reception problem down here is difficult because of the fringe area position. Believe me, when I tell you almost everything that has come along has been tried.

Now, we have finally found the answer in your V8 antenna. Servicemen tell us its the best antenna we have ever had. It really does the job because it pulls in stations we could not get before.

Attached is another reorder, please keep them coming.

Sincerely yours,  
 BURROUGHS RADIO INC.

*D. R. Hartong*  
 D. R. Hartong

drh/iw

**SEE FOR YOURSELF**  
 Try One On Your  
 Toughest Location



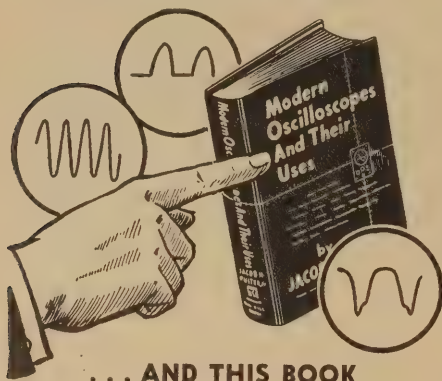
**THE RADIART CORPORATION CLEVELAND 13, OHIO**

VIBRATORS • AUTO AERIALS • TV ANTENNAS • ROTORS • POWER SUPPLIES



# 'SCOPES ARE "GOLD MINES"

... when you know how  
to use them fully on all  
types of service jobs



... AND THIS BOOK  
MAKES IT EASY TO LEARN  
ALL ABOUT THEM!

No question about it! The cathode ray oscilloscope is the handiest, most useful instrument in radio-TV servicing today. Servicemen who master it get the best jobs—make the most money—work lots faster—and are headed for even bigger things in the future!

## MODERN OSCILLOSCOPES AND THEIR USES

By Jacob H. Ruiter, Jr.  
of Allen B. DuMont Laboratories, Inc.  
326 pages, 370 illustrations, \$6.00

- ✓ When, where, why and exactly how to use them
- ✓ How to interpret patterns
- ✓ How to handle tough jobs easier and faster

Now the oscilloscope won't "stump" you—not when you have the clear explanations given by this famous book! It contains no involved mathematics—no puzzling and complicated discussions. Instead, it goes right to work explaining oscilloscopes fully and showing you exactly how to use them in lab work and on AM, FM and TV service work—from locating troubles to handling tough realignment jobs. Each operation is carefully explained including determining where and how to use the 'scope; making connections, adjusting circuit components, setting the controls and analyzing patterns fast and accurately. 370 illustrations including dozens of pattern photos make things doubly clear.

No other type of specific service method training can mean so much to you in terms of efficiency and greater earning power! Send for it today. See for yourself how this book can help you—before you buy!

**READ IT 10 DAYS . . . at our risk!**

Dept. RE-13 RINEHART BOOKS, Inc.,  
Technical Division,  
232 Madison Ave., New York 16, N. Y.

Send MODERN OSCILLOSCOPES AND THEIR USES for 10-DAY EXAMINATION. If I decide to keep the book, I will then remit \$6.00 plus a few cents postage in full payment. If not, I will return book postpaid and owe you nothing.

Name \_\_\_\_\_

Address \_\_\_\_\_

City, Zone, State \_\_\_\_\_

Employer's Name & Address \_\_\_\_\_

OUTSIDE U.S.A.—Price \$8.50 cash only. Money back if book is returned in 10 days.

The input impedance (by virtue of the negative feedback caused by the cathode resistor) is very high indeed. This fact enables us to get adequate gain in a complete amplifier in spite of the wastage in the phase-splitter. Let us see why we have such a high input impedance. Suppose that we apply 1 volt positive to the input terminal: the cathode will rise to 0.98 volts, leaving only 0.02 volts across the grid leak. If this is 100 kilohms, the current through it will be 0.2  $\mu$ a. At the input it will appear as though 1 volt has produced 0.2  $\mu$ a current, so the apparent input impedance will be 5 megohms. We can use this very high resistance as the load for a pentode amplifier stage and obtain a correspondingly high increase in its voltage gain. This will make up the loss of gain in the triode phase splitter, because the two stages together would hardly have shown such a high gain normally, anyway.

### A more refined circuit

Fig. 7 shows the way in which the circuit is arranged. The supply to tube 1 passes through  $R_1$ ,  $R_2$  and  $R_3$  in series, with  $R_1$  as the useful part of the load. The load on tube 1 is  $R_1$  in parallel with  $R_3$  multiplied by the feedback effect in tube 2. The impedance in shunt across X and Y is of the order of megohms, so that tube 1 has a very high gain; so high indeed that we can use the simple  $gmR_L$  expression for the gain of a pentode ( $R_L=R_1$ ).  $R_2$  is needed to prevent Y from being grounded by the decoupling capacitor  $C_3$ , and  $R_2$  is, for a.c., in parallel with  $R_4$ , the cathode load resistor of tube 2. Since  $R_4$  settles the voltage at which the cathode is set, and the steady current conditions in tube 2, it cannot be made too large. We must therefore reduce the value of the plate load of tube 2,  $R_5$ , and tube 2 will not be operating under ideal conditions. The values shown in Fig. 7 represent a reasonable compromise, however. (The values are all even numbers—the nearest preferred values will work in a practical circuit.)

Perhaps the most serious disadvantage of this circuit is the fact that the gain depends on the amplification factor of a pentode, a number which you never see in the books. Just how constant this quantity is I do not know.

We can, of course, stabilize the gain of the complete amplifier by using negative feedback, but here we meet another difficulty. The plate capacitance of tube 1, together with the capacitance of the unit to ground, will be in parallel with the very high pentode plate load. Perhaps with care these can be kept down to 20  $\mu$ mf but with a 5-megohm effective load the characteristic frequency is 1,600 cycles. This means that the response will be 6 db down at 3,000 cycles, so that the feedback will only have half the expected effect on the third harmonic of 1,000 cycles, while as this stage alone is 18 db down at 12,000 cycles we shall need a relatively large feedback just to flatten the response.

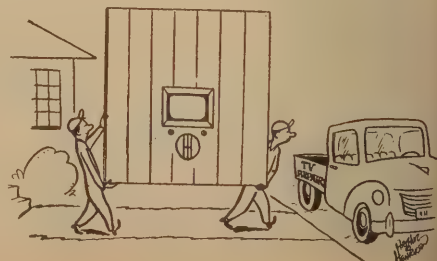
This last analysis is over-developed, if you examine it critically. The average small pentode has a plate impedance of about 1 megohm, which is in parallel with the load, so that this alone shifts the characteristics frequency up to about 9 kc. Furthermore, there is no gain to be obtained by pushing up the load from say 2 megohms to 5 megohms. We shall probably do better, indeed, to drop  $R_1$  to 33,000, get more current through our tube and thus increase its amplification factor, at the same time widening the response slightly. We shall still get about 60 db from our two tubes, so that if the final stages need 20 volts drive we can operate with 20 mv input. But this is neglecting the gain reduction caused by the negative feedback which I hope all my readers use lavishly.

The circuits shown in Figs. 6 and 7 are two of the most important phase-splitter circuits. They provide a very well balanced output, are almost independent of the characteristics of the phase-splitter tube over the range of commercial tolerances, and involve no trick circuitry. The only disadvantages are that the tube must have good heater-cathode insulation (both to prevent breakdown under the voltage stress and to prevent the leakage of 60-cycle hum into the cathode resistor) and that one tube must provide sufficient swing to drive both the push-pull grids.

Thus if each grid requires 20 volts, the tube must be capable of giving 40 volts under normal amplifier conditions. When driving class-B amplifiers, such as the EL34 stage I described some time ago, which needs 40 volts peak for each grid, this demand for 80 volts peak is too much for a small tube. Some designers have therefore followed a phase-splitter of this type with a push-pull intermediate driver. I am not enamored of this solution, which puts in an additional double triode to do work which could be done better by a single tube elsewhere in the circuit.

In the article which will follow this I propose to discuss the other main type of phase-splitter. As I said in the first article, this obtains its balance by using very large amounts of negative feedback. It must not be confused with the circuit discussed above, in which the negative feedback is an unwanted result of our desire to ground one side of the input. In the circuits which follow, the negative feedback is deliberately introduced to force the two outputs to balance. But that will be another story.

END





# Booster performance depends on noise figure!

**Gain alone is NOT enough!**

## CHANNEL MASTER

### a new kind of SINGLE CHANNEL TV BOOSTER

with the  
Highest gain      Lowest noise  
in amplifier category

**GAIN:** 12 Times (22 DB), low band;  
8.5 Times (18.6 DB), high band.

**NOISE:** 4.5 DB, low band; 6.5 DB, high band.

The only single channel booster with **CASCADE-type CIRCUIT**  
Uses famous, low-noise 6BQ7 tube.

Double-tuned transformers for peaking both video and sound.  
Antenna by-pass switch.

TV "snow" is noise generated by the set and booster. The amount of noise present depends primarily upon the first tube in the receiving system.

This means that where a booster is used, the amount of "snow" in the picture depends almost entirely upon the performance of the booster, and the tube(s) it uses. Most single channel boosters on the market today have poorer Noise Figures than modern TV front ends. Therefore, while these boosters may contribute gain, they actually deteriorate picture quality by adding noise.

Katy-B is the first modern single channel booster. It employs the famous, low-noise 6BQ7 tube in a Cascode-type circuit, which gives the lowest Noise Figure and highest gain ever obtained in a television booster.



list price **\$24<sup>40</sup>**

Actual Performance Figures prove that Katy-B tops 3 leading boosters!

	KATY-B	Booster S	Booster B	Booster C
<b>Gain</b> (high no. preferred)	8.5 Times	4.2 Times	5.9 Times	6.2 Times
<b>Noise</b> (low no. preferred)	6.5	14.3	8	9.1
<b>VSWR</b> (low ratio preferred)	1.5:1	9:1	2.6:1	3.8:1
<b>Balance-to-Unbalance Ratio</b> (high ratio preferred)	10:1	1.4:1	5.8:1	7.1:1

Typical Comparison on Channel 12

FREE: Educational new booklet—  
"The 4 Standards of Booster Performance."

Ask your Channel Master distributor  
for your copy.



**CHANNEL MASTER CORP.**

ELLENVILLE, N. Y.





# ELECTRONIC MUSIC---the easiest way

## PART II

By V. FASTENAEKELS

**N**OW FOR some of the constructional features of the *Ondiovox*. The parts most likely to be unfamiliar are the keyboard and the metal-tubing base pedestal, but neither of these should present any great difficulty if you can use simple woodworking tools and an electrician's "hickey".

Taking the keyboard assembly first, you can get a general idea of the layout from Photo A. Details are shown in Fig. 1-a and 1-b. The entire assembly was mounted on a steel foundation

plate 17 inches long, 3 inches wide, and  $\frac{1}{4}$  inch thick. This slab just happened to be available, and a shallow metal radio chassis could be used as well. The base plate is just long enough to accommodate the 21 hand-made keys. These were cut from oak strips, but there is no reason why you can't use a section of an old piano or organ keyboard. The base plate or chassis is simply made long enough to accommodate the over-all width of the 21 keys.

The key switch contacts are mounted side by side on a full-length bakelite

insulating plate, with the same center-to-center spacing as the keys. The contacts can be assembled from old phone jacks, or from Guardian type 200-3 contact assembly kits. The stack assembly screws must be countersunk in the bakelite, or kept short enough to clear the metal base. Adjust the contacts so that a slight pressure on the key closes the top pair first and energizes the keying relay; additional pressure bends the closed pair down far enough to meet the bottom contact, which grounds the appropriate resist-

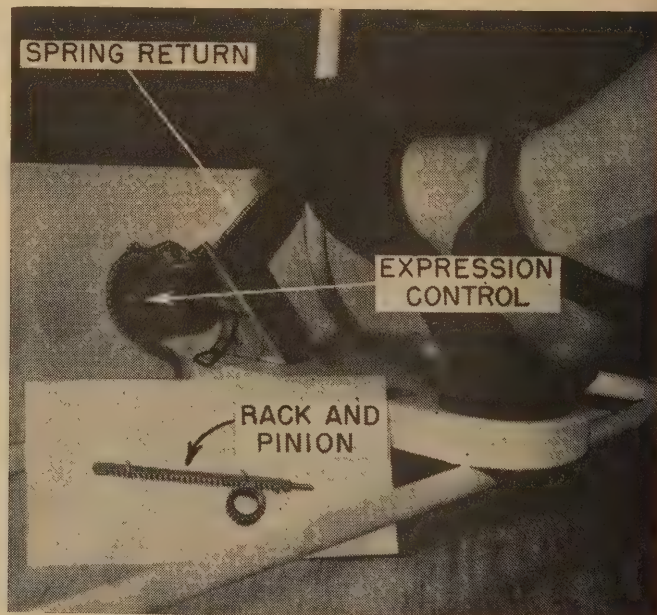
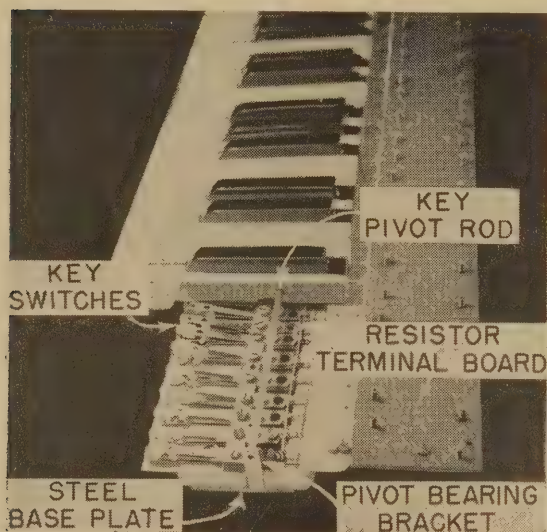


Photo A (upper left)—Keyboard construction. Photo B (upper right)—Keyboard and chassis assembly. Large bulb is European neon lamp. Photo C (lower left)—Completed *Ondiovox*. Photo D (lower right)—Expression control.



Depend on Mallory  
for  
Approved Precision Quality



## Get More Jobs Done In A Day

There's no profit in sets waiting to be repaired. Profits depend on turning out more jobs . . . and cutting down on time wasting call-backs.

Midgetrols® are designed for fast, easy installation in any set, TV or radio.

*Round tubular shafts* can be cut accurately and quickly . . . fit split-knurl or flatted-type knobs.

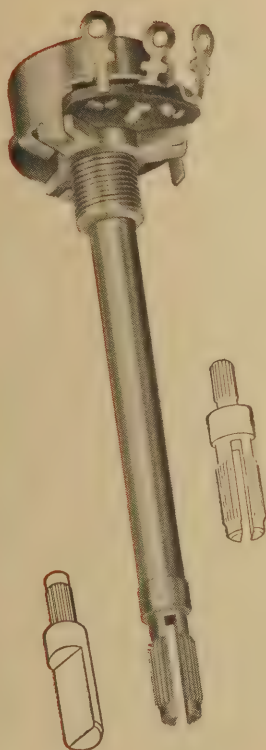
*AC switches* can be attached instantly without disassembling the control.

*Their unique design* simplifies inventory problems . . . always available from your Mallory Distributor.

Midgetrols are engineered to duplicate the precise characteristics of original equipment. They will give equal . . . and often better performance and life than the original control.

Save time . . . find extra minutes to turn out more finished jobs . . . be sure of dependable, precision quality for all your TV and radio repairs . . . ask for Mallory Midgetrols the next time you call your distributor.

*Another time saver.* Get your copy of the Mallory Control Guide. It is a complete cross reference between set manufacturers' part numbers and the equivalent Mallory control.



P. R. MALLORY & CO. Inc.  
**MALLORY**

CAPACITORS • CONTROLS • VIBRATORS • SWITCHES • RESISTORS  
• RECTIFIERS • VIBRAPACK\* POWER SUPPLIES • FILTERS

\*Reg. U.S. Pat. Off.

**APPROVED PRECISION PRODUCTS**

P. R. MALLORY & CO. Inc., INDIANAPOLIS 6, INDIANA



# WALSCO

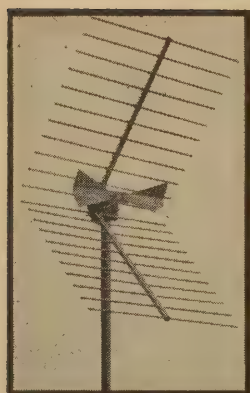
# UHF

**FIRST**  
antenna to be  
tested and  
accepted in  
Portland

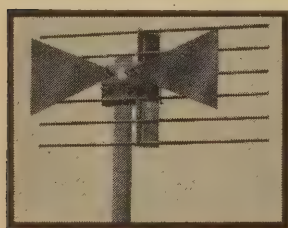
**PROVEN**  
America's Finest  
all-channel  
UHF  
antenna

**GUARANTEED**  
everywhere,  
anywhere  
for one  
full year

**AVAILABLE NOW!**



Corner Reflector Model 4450



Reflecto-Fan Model 4400

Gain in db.*			
Freq. MC	Mod. 4400	Mod. 4402	Mod. 4450
500	2.2	5.5	7.8
600	3.	5.5	8.9
700	4.	6.	11.
800	4.	8.5	12.9
900	4.5	8.	12.3

\*Measured gain over tuned folded dipole

List Price  
Model 4400 (Single Bay)..... \$ 6.75  
Model 4402 (Dual Stack)..... 14.25  
Model 4450 (Single Bay)..... 14.50

## WALSCO

Walter L. Schott Company  
3225 Exposition Place  
Los Angeles 18, California

Overseas Representative: Ad Auriema, Inc. 89 Broad St., New York 4, N. Y.

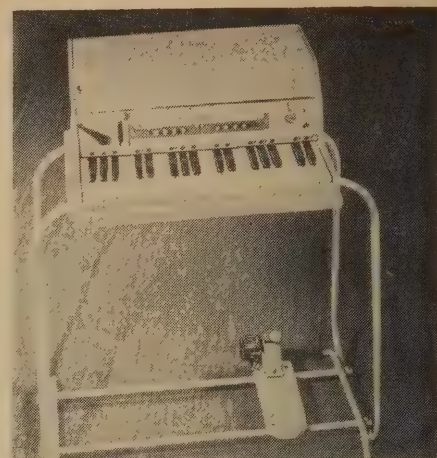


Photo E—Ondiovox pedestal is formed easily from thin-wall electrical conduit.

or in the tone-generator circuit.

The keys are pivoted on a common steel rod P, supported at the ends by drilled angle brackets. Other brackets may be inserted along the length of the key strip for additional support.

The *extended-bass* selector is a 12-pole, 3-position switch, such as the Mallory type 1266L. This can be mounted on a bracket at right angles to the front panel, and operated with a lever type arm, as shown in Photo C.

The step type *expression* (volume) control (Photo D) was assembled on a broadcast-type attenuator body, but any sturdy 21-point wafer switch such as the Mallory type 13124L or Centralab type 1443 will do. The shaft was fitted with a small pinion gear, driven by the foot-operated rack. The entire expression-control assembly can be made easily from an old automobile accelerator mechanism.

The pedestal was formed from thin-wall electrical conduit. The bends can be made with an electricians' pipe-bending tool, commonly called a "hick-ey". The sections are drilled and bolted together at the bottom, and joined

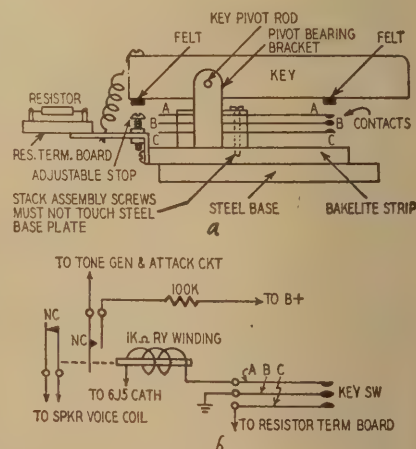
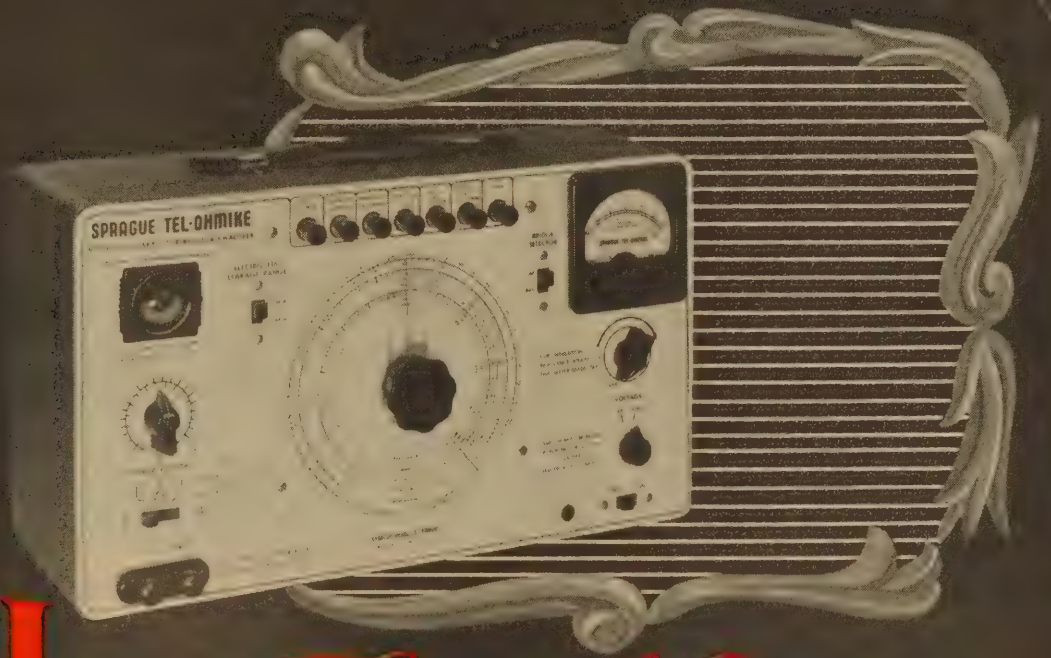


Fig. 1—(a) Keyboard assembly details. (b) Wiring diagram of the key switches. All "A" contacts and all "B" contacts are connected in parallel. "C" contacts go to individual resistors on terminal board.

at the top in a heavy wood platform which supports the main chassis and keyboard. See Photos C and E. END





*Here's The New*

## Model TO-4 **TEL-OHMIKE** CAPACITOR-RESISTOR ANALYZER

- You'll be proud to have this completely new instrument on your service bench!
- The result of a nationwide survey of radio and television technicians makes the new TO-4 Tel-Ohmike meet your capacitor test needs to a capital "T". Trim and trustworthy, it has instant push-button range selection, magic-eye bridge balancing, safety discharge feature, direct meter readings of leakage current and insulation resistance, and a continuously adjustable test voltage for checking electrolytics at exact rated voltages.
- Two especially valuable features are the provision of a special low capacitance circuit for checking small ceramics and "gimmick" capacitors down to 1 mmf (in addition to a top capacitance range of 2000 mf) and the simplified insulation resistance circuit with a top reading of 20,000 megohms.
- See a demonstration of this new instrument at your distributor without delay!
- And the price of this new improved Tel-Ohmike is still the same . . . . Only **\$73.50** NET.



Write for full descriptive bulletin today

**SPRAGUE PRODUCTS COMPANY**

(Distributors' Division of Sprague Electric Co.)

81 MARSHALL STREET, NORTH ADAMS, MASS.

ANOTHER NEW DEVELOPMENT BY THE WORLD'S LARGEST CAPACITOR MANUFACTURER



# CRYSTAL MARKERS for SWEEP GENERATOR

By BRUCE MORRISSETTE

This simple marker generator converts an inexpensive sweep generator into a precision instrument.

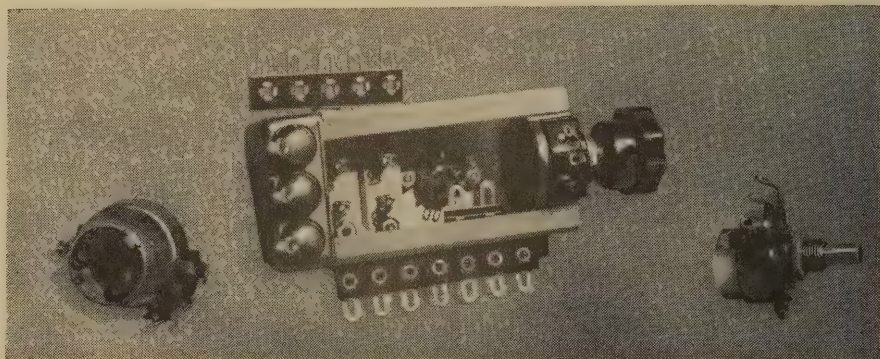


Photo A—The calibrator before wiring.

**S**WEEP generators for aligning wide-band i.f. amplifiers in television and FM sets usually need highly accurate marker signals or pips for identifying frequency points along the response curve. Accurate markers are especially important for peaking individual coils and setting sound and adjacent-channel traps. Intercarrier receivers also require an accurate 4.5-mc unmodulated signal for aligning sound-take-off windings and discriminators.

The two most common sources of marker signals for sweep alignment are the *built-in* marker (either a calibrated tunable oscillator, or a passive, absorption-type network), and the *external* marker oscillator or signal generator. The absorption-type marker is useful for locating points along the response curve but cannot serve as a single-frequency r.f. source for aligning individual stages. A variable marker oscillator, internal or external, not only will mark points on the curve but may be used to tune individual coils and traps.

Both types leave much to be desired with respect to accuracy of calibration. Most modern i.f. systems are stagger-tuned at various fractional frequencies like 25.3 mc, 23.1 mc, and 21.7 mc. Even the best tunable marker oscillators and signal generators may be off calibration by as much as 0.5 mc, making it practically impossible to align a set

exactly at the specified frequencies. A few of the more expensive TV generators are equipped with crystal calibrators which give accurate marker pips every 2.5 mc or 5 mc along the curve.

The low-cost, easy-to-construct unit described here not only gives accurate markers at 0.5-mc intervals, but provides a 4.5-mc, crystal-controlled, pure r.f. signal for intercarrier alignment. The wide range of marker pips is adequate for almost any servicing or design need, and all have the high accuracy and stability associated with a well-designed crystal oscillator.

Although this marker oscillator-mixer was constructed to fit a *Heathkit* model TS-2 sweep generator, it can be installed in almost any other make or model, or built as an independent unit. The choice of crystal frequencies and the use of either separate or mixed outputs gives the unit unusual versatility. It consists of separate 4.5-mc and 5-mc crystal oscillators. Either crystal or both may be disabled by switching off the B supply to the appropriate oscillator, and each section has its own output-control potentiometer. A mixer-amplitude control adjusts the combined outputs of the two crystals to any desired level, and a simple mixing network added to the sweep-generator combines the sweep signal and the crystal-marker frequencies at the sweep output terminals.

## Circuit details

Fig. 1 is the schematic diagram of the dual-marker unit. Each section of the 6J6 is connected as a Pierce crystal oscillator. Using r.f. chokes rather than resistors in the plate circuits increases the output on the higher harmonics essential in this application. Amplitude of oscillation is controlled by individual potentiometers which vary the B plus voltage to each plate. Switches on these controls turn the individual oscillators off and on, by opening or closing the B plus line. With a single crystal switched on, the cathode potentiometer (R1) functions as the load resistor of a conventional cathode follower, providing the correct low-impedance match for connecting the marker in parallel with the output of the sweep generator.

When both crystals are operating, the 6J6 functions as a mixer, since the two triodes have a common cathode resistor. The output contains the frequency difference between the two crystals (0.5 mc) and harmonics of 0.5 mc extending to 50 mc and even higher. Sum frequencies also appear in the combined output (9.5 mc and its harmonics), but they are superimposed on 0.5-mc pips. The 0.5-mc pips are given uniform amplitude by adjusting the relative outputs of the two crystal oscillators with potentiometers R2 and R3.

The height of the pips on the alignment curve itself is controlled by

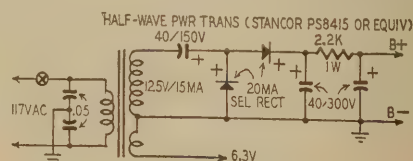
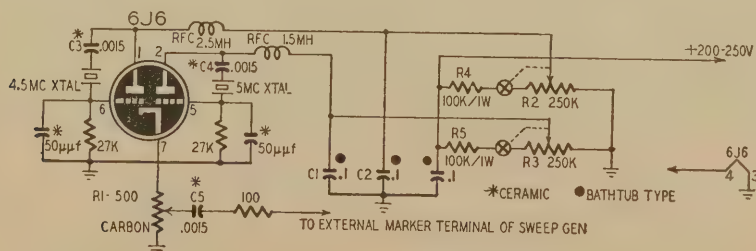


Fig. 1 (left)—Schematic of the dual-frequency calibrator. Operating power may be obtained from the sweep generator or from the power supply in Fig. 2. Fig. 2 (right)—Power-supply schematic.





PATENT APPLIED FOR

# THE NEW *Synkote* "OVALTUBE"

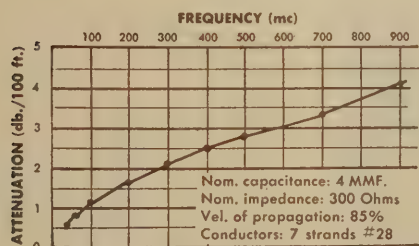
*Low-loss tubular twin-lead  
for better reception on VHF and UHF*



**SEAL THE ENDS IN 60 SECONDS**  
Simply heat with match or cigarette lighter, then squeeze ends together with pliers or knife blade.



**USE YOUR REGULAR HARDWARE**  
Synkote OVALTUBE fits into the usual slotted stand-off insulator quickly and easily. No special threading, no special hardware required.



Here is a unique, *practical* down-lead that minimizes the effects of dirt, salt air and moisture on TV picture quality. Smooth, rounded exterior — no place for dirt to accumulate. Fits the same hardware and handles as easily as ordinary twin-lead, but gives excellent, trouble-free reception under *all* weather conditions!

*Synkote OVALTUBE twin-lead is available now. Ask your Plastoid representative . . . or mail coupon today.*

## PLASTOID Corporation

plant: HAMBURG, N. J. | offices: 42-61 24th St., Long Island City 1, N. Y.

PLASTOID CORP.  
42-61 24th St., Long Island City 1, N. Y.

- ☐ We are interested in Synkote OVALTUBE.  
☐ We are also interested in ☐ hook-up wire; ☐ twin-lead;  
☐ coaxial cable; ☐ microphone cable; ☐ multi-conductor cable.

Name: .....

Company: .....

Address: .....

City: ..... State: .....



cathode-potentiometer R1. (Like all marker signals, they should be kept at the lowest possible level to avoid distorting the response curve. About one-eighth to one-quarter inch is right for

the average pattern on a 3-inch or 5-inch oscilloscope.)

The 50- $\mu$ f ceramic capacitors across the grid resistors give added reliability of operation in the Pierce circuit. Plate-

supply decoupling is accomplished by resistors R4 and R5 and capacitors C1 and C2. Capacitors C3 and C4 isolate the crystals from the d.c. on the oscillator plates. C5 couples the output from R1 through a 100-ohm isolating resistor, which reduces interaction between the marker circuit and the sweep generator. The supply voltages for the marker unit are taken from the sweep generator, or the small power supply shown in Fig. 2 may be added. The total drain with both crystals functioning is less than 5 ma.

### Construction

The photographs (A, B, and C) show the unit during and after construction, and D and E show the unit mounted on the front panel of the Heathkit TS-2. The small aluminum chassis (1 $\frac{1}{4}$  x 3 $\frac{1}{8}$  x 1 inch) is a standard commercial type and is supported firmly by the shaft bushing of control potentiometer R1. An aluminum bracket may be added if desired.

The photos show the layout of the tube socket, crystal holders, "outboard" tie-points for the r.f. chokes, and the triple-0.1- $\mu$ f bathtub capacitor. Potentiometers R2 and R3 are mounted on the sweep-generator front panel, the 4.5-mc control at the left and the 5-mc control at the right. The parts values in the output circuit should be followed closely, since they were chosen to reduce interaction between the crystal markers and the sweep generator to a minimum. The only moderately expensive items are the crystals. A well-known mail-order house (Allied Radio) offers Bliley 5-mc crystals at \$2.80 and 4.5-mc crystals for \$3.25, bringing the total cost of the unit to about \$10.00.

### Using the marker unit

Testing and using the complete unit involves straightforward procedures. It is assumed that the reader is already familiar with the technique of applying the sweep generator to the mixer or first i.f. grid; with connecting the oscilloscope across the video-detector load resistor (preferably through an isolating resistor of about 25,000 ohms); and with supplying the scope sweep with synchronized horizontal input from the sweep generator.

First, connect the sweep generator with the built-in marker unit to a television or other wide-band-i.f. amplifier known to be approximately in alignment, or at least capable of passing the i.f. signal. Phase the sweep response curve on the scope screen or throw the blanking control—if one is provided—to the ON position for single-trace operation.

Adjust the curve to normal height with the sweep-generator attenuator, and switch on the 5-mc crystal. With cathode control R1 well advanced, rotate output control R3 until a 5-mc harmonic pip in the pass band of the i.f. strip appears on the curve. Most television-i.f. amplifiers include 25 mc somewhere near the flat top of the curve (see Fig. 3). Keep the pip ampli-

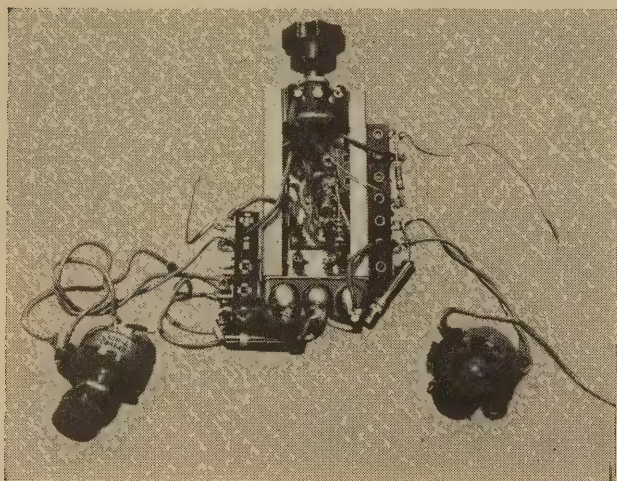


Photo B—Under-chassis view of the completed unit. Miniature capacitors and tube reduce the overall dimensions.

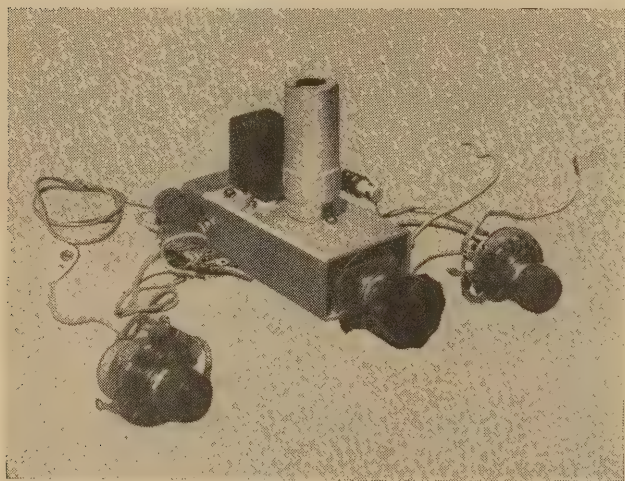
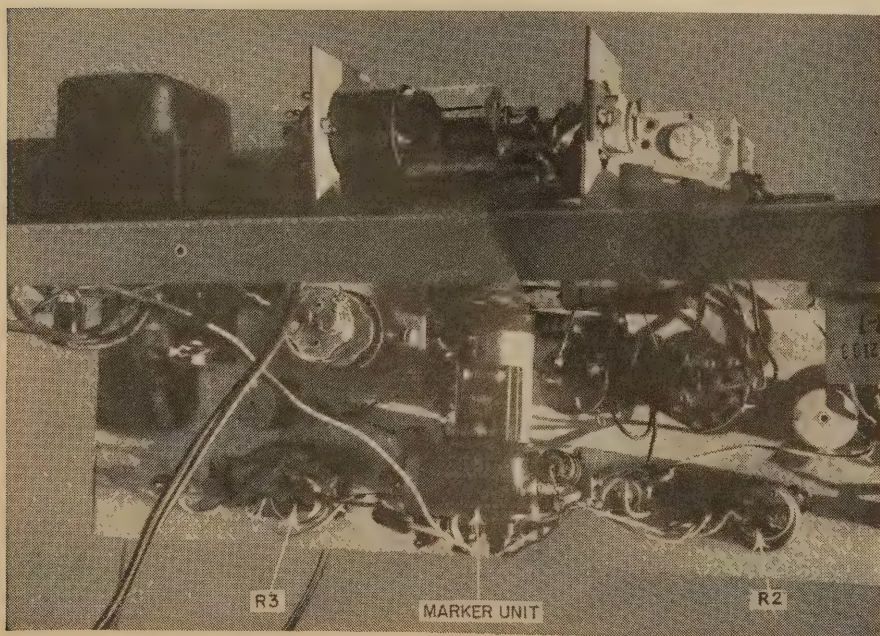


Photo C—A top view of the finished calibrator. The output controls and on-off switches are at the ends of flexible leads.







2-83  
UHF-VHF

#### ULTRA Q-TEE Suburban

Operates similar to Ultra Q-Tee (above) but is designed for all-channel VHF and fringe area UHF.



UHF

#### UHF COLINEAR

High gain broad band fringe area UHF antenna. Four models cover entire UHF range. Also available in side-by-side array with special stacking kit.



UHF

#### ALL-CHANNEL Q-TEE

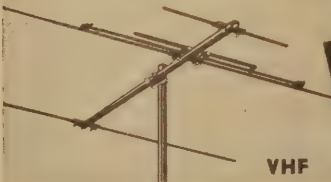
The brilliant all-channel VHF performer with patented\* printed circuit channel separators. Also may be stacked for additional gain.



VHF

#### LONG JOHN

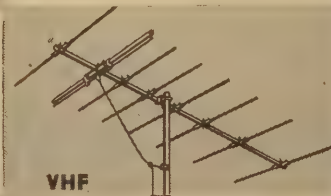
The original eight-element high gain single channel yagi. Also the super high gain twelve-element Long Long John. Both series also available with economy-priced Delta Match.



VHF

#### JC YAGI

The original, most popular and most powerful five-element yagi. Also available in new low priced DC series.



VHF

#### MIGHTY MATCH MM-30

A small device destined to play a mighty role in combining VHF-UHF antenna systems with a single transmission line. Entirely automatic in operation. Patented\*

\*Lic. A.A.K. Pats.  
2,422,458;  
2,282,292;  
2,611,086;  
others pending.

**FREE!**

#### UHF ANTENNA GUIDE

Already in its second printing, this authentic guide to UHF antenna systems tells "how, what and where" for every area.



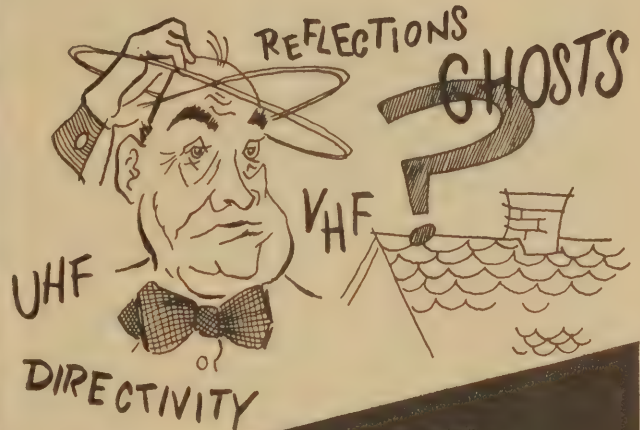
THE LaPOINTE - PLASCOMOLD CORPORATION - ROCKVILLE, CONN.

- ☐ Send UHF Antenna Guide  
☐ Send complete VEE-D-X catalog

NAME.....  
STREET.....  
CITY..... ZONE.... STATE.....

**don't be  
a victim of**

**Antennitis\***



**Be Sure With  
PERFORMANCE PROVEN  
VEE-D-X**

Only VEE-D-X offers you a truly complete line of performance-proven antennas and accessories for every area—every reception condition—every possible combination of VHF and UHF stations.

\*Antennitis—a present day epidemic of needless confusion concerning UHF-VHF antenna installations.



**BURSTEIN-APPLEBEE CO.**  
**FREE!**  
 HERE ARE ONLY A FEW OF THE BIG VALUES IN THE LATEST 148 PAGE 1953 B-A CATALOG!  
 Write us if you have not received it

BURSTEIN-APPLEBEE CO.

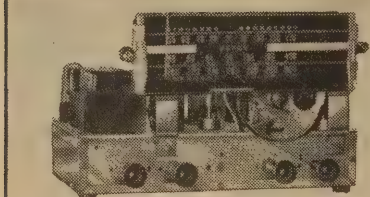
1012-14 McGee St., Kansas City 6, Mo.

☐ Send Free B-A Catalog No. 531.☐ My order is attached for items from below \$.....enclosed.

Name.....

Address.....

City.....State.....



### 12-TUBE FM-AM CHASSIS COMPLETE

**\$56<sup>88</sup>**

Here at a **BIG SAVING** you get a complete celebrated make AM-FM Radio Chassis for modernizing old sets, for new custom installations, built-ins, etc.

Top make latest design, with built-in pre-amp for Phono operation with either reluctance or crystal type pick-up. Tunes standard broadcast 550 to 1700 KC and FM 88 to 108 MC.

Wide range audio response (push-pull 6V6 output) and bass boost tone control. Tubes: 6BE6, 2-6BA6, 2-12AT7, 2-6SQ7, 6SH7, 6AL5, 2-6V6GT and 5Y3GT rectifier. Attractive lighted slide rule dial.

Supplied ready to operate, complete with tubes, antennas, escutcheon and hdwe. for mtg. in a table or console cabinet, built-ins, etc. Chassis size 13 1/4" wide x 9" high x 9" deep. Cutout required for dial escutcheon 7 3/4 x 2 3/4". Operates on 115 V 60 cycle AC. Output impedance 3-4 ohms, for any PM or Co-Axial Speaker. Shpg. wt. 20 lbs.

No. 31B18. ONLY **\$56.88**

### COMBINATION DEAL \$92<sup>88</sup>



Consists of above Chassis, a top make \$51.50 List Value 3 Speed Changer with GE Variable reluctance turnabout Cartridge and a \$32.50 List Value 12" Coaxial Speaker.

DEAL NO. 31A273. Shpg. wt. 38 lbs. \$203.50 List Value.....**\$92.88**



### 6AK5 TUBES

Made by Sylvania and bears the name "Standard" because they were originally intended for use in Standard Boosters—otherwise the identical 6AK5 you would obtain if buying tubes bearing the Sylvania name and for which you pay up to \$2.06 Net Each (List Price \$3.90 Ea.). Here you get 6 for little more than the regular price of 2 and believe us—they are perfect—new—fully guaranteed—a popular type widely used in Radio, TV, Boosters, etc.

No. 70A98. Pkg. of SIX 6AK5

Sylvania Made Tubes, Only.....**\$4.79**

INCLUDE ALLOWANCE FOR POSTAGE—  
ALL OVER-PAYMENTS REFUNDED.

**BURSTEIN-APPLEBEE CO.**

1012-14 MCGEE ST. KANSAS CITY, MO.

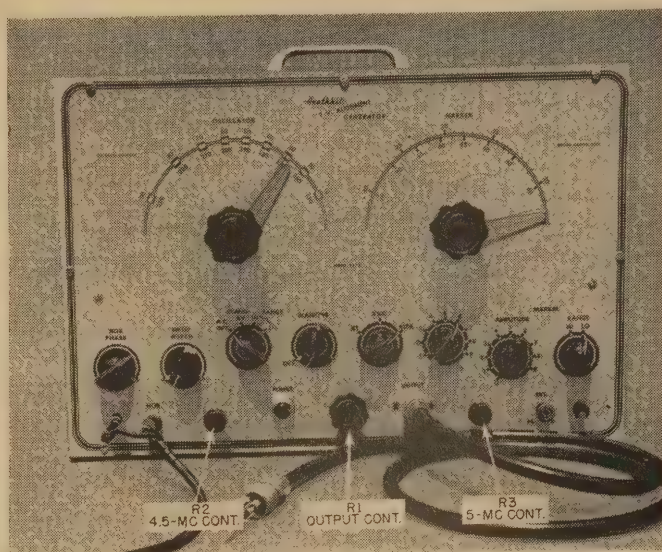


Photo E—Panel of the modified sweep generator showing the added marker oscillator controls.

tude at a minimum; too much signal from the marker will distort the curve.

Now turn off the 5-mc crystal and switch on the 4.5-mc section. The same amplitude-regulating procedure (this time with R2) will give a pip at any harmonic of 4.5 mc which lies in the i.f. pass band. In ordinary TV receivers, the 22.5-mc pip will be prominent on the curve. Well-designed wide-band i.f. amplifiers will also show the next harmonic pip at 27 mc (see Fig. 4).

If both harmonic pips of the 4.5-mc crystal are visible, the bandwidth characteristics of the amplifier can be seen at a glance, since the separation of the two markers is the 4.5-mc difference that separates video and sound carriers, and which is fundamental to the design of ideal i.f. circuits.

When each crystal is oscillating satisfactorily, as indicated by its harmonic pips, switch them *both on*. Adjust controls R2 and R3, and the cathode control R1, to produce a line of uniform markers of convenient height, each of which is separated from the next by the crystal difference frequency of exactly 0.5 mc. The response pattern should then have the appearance of Fig. 5. Output control R1 should be used to adjust the amplitude of the 0.5-mc pips with respect to the alignment curve.

The 0.5-mc pips may be identified by noting the nearest reference pip from either the 5-mc or the 4.5-mc crystal, and counting the order of the 0.5-mc pip in question from that point. For example, the first pip *above* 25 mc would be 25.5 mc, the second, 26 mc; the first pip *below* 25 mc is 24.5 mc, the second, 24 mc, and so on.

Some of the newer i.f. systems will need a 45-mc pip as a reference point. Since any television-i.f. response curve must have a bandwidth of about 4.5 mc, there will always be a 4.5- or 5-mc reference point on the curve.

In the *Heathkit* and similar instruments the built-in absorption marker can be checked against the 4.5- and 5-mc pips and then used to identify the value of a 0.5-mc pip, although its

accuracy without the crystal-marker guide is insufficient for precise work. Of course, an external signal generator or other *active* marker device may also be included in the setup, especially when it is desired to set such a device to some fractional frequency, as discussed earlier. Since there are no tuned circuits to adjust in the crystal-marker unit, its accuracy is limited only by the precision of the crystals used (in this case  $\pm .02\%$ ).

In testing or aligning an i.f. amplifier, turn on the 0.5-mc pip series as soon as the response curve appears. Bandwidth between any two critical points can be determined almost instantly. The point at which the picture-carrier should appear, as shown in the service information for the set, is located by counting pips or running the tunable marker along the pips. If the picture carrier is not at its proper position (usually exactly halfway up on one side of the response curve) the i.f. stages must be adjusted to correct the misalignment. The vestigial-sideband transmission employed in television requires that modulating frequencies extending approximately 1 mc above and below the video carrier be amplified by the same amount as the higher-frequency video components for which only one side band is transmitted.

The sound i.f. carrier point, on the other hand, must be almost at the bottom at the opposite end of the curve to avoid sound interference in the picture, and to minimize 60-cycle sync buzz in intercarrier receivers. Many of the better intercarrier sets have a "sound shelf" or flat portion near the bottom of the curve for the sound i.f. carrier. Ordinary marker systems cannot be relied on to identify this point without significant error, but the marker pips from the crystal unit will locate it exactly.

With the sweep generator on stand-by, the output of the 4.5-mc crystal can be used for intercarrier sound alignment. (The 5-mc crystal is turned off during this operation.) Service manuals explain the manner in which the



"WHY SHOULD I INSIST  
ON **CBS-HYTRON**?"

"**YOU PROFIT MORE!**  
HERE ARE  
**5 BIG REASONS WHY**"

- 1. CBS-HYTRON IS FAMOUS... EASY TO SELL.** The magic letters "CBS" are plugged for you on radio and TV station breaks... 102 BILLION times a year! CBS is known and respected by *all* your customers. CBS-Hytron is the profitable brand with endless sales assistance.

- 2. CBS-HYTRON SPECIALIZES IN RECEIVING TUBES.** Since 1921, CBS-Hytron has concentrated on receiving types. Practice makes perfect. Put those years of know-how to work for you. Let time-proved CBS-Hytron dependability cut call-backs... make more money for you.

- 3. CBS-HYTRON LEADS IN TV TUBES.** You know them. CBS-Hytron TV originals: 1AX2, 1X2A, 6BQ6GT, 12A4, 12B4, 12BH7, 12BY7, 12BZ7, 25BQ6GT, and the original rectangular 16RP4. Even CBS-Hytron standard TV tubes are designed-for-TV... tested-for-TV... to give you peak performance and profit.

- 4. CBS-HYTRON IS ULTRAMODERN.** CBS-Hytron is the tube of the future. Made in the world's most modern plants. On manufacturing equipment years ahead of the rest of the industry. CBS-Hytron advanced design and precision construction keep you always ahead. Give you tomorrow's trouble-free performance today.

- 5. CBS-HYTRON IS MATCHED-TO-THE-SET.** Combined engineering skills of leading set makers and CBS-Hytron work hand in glove for you. CBS-Hytron tubes are originally set-engineered right into the sets of 9 out of 10 leading set manufacturers. No wonder CBS-Hytron is your logical matched-to-the-set replacement tube.

**IT PAYS TO BE FUSSY!** Just any standard brand won't do. If you want: Trouble-free, advanced performance. Maximum customer satisfaction. Minimum call-backs. More profit. Five big reasons point the way: Insist on CBS-Hytron!



**CBS-HYTRON**  
Germanium Diodes

Complete data yours for the asking. Write  
CBS-Hytron, DANVERS, MASS., today.





# Rytel

## ALL CHANNEL ANTENNA

for Crystal Clear,  
Magic Mirror  
TV Reception

### MODEL RDV-2-83

This latest innovation in all channel antennas consists of Rytel's superior VHF antenna plus the new DOUBLE-O UHF design which showed such excellent results in Portland, Oregon tests, outperforming all other UHF models. Pick the stand-out performer to satisfy VHF customers and bring in the new business that UHF television broadcasting will mean.

Due to the variance in space required between UHF and VHF, it is advisable that the VHF be stacked in the conventional manner with the UHF stacked as shown. Your distributor can supply technical information.

### MODEL RDV-1—A skillfully-engineered VHF antenna including:

New type head made of latest "high impact" plastic; will not break, crack or swell. Unique locking design with flat metal strap to insure complete metal-to-metal contact. This means 300 times more effectiveness in electric contact, superior mechanical gripping power.

Special locking of twin leads before attaching to terminals which eliminates breaking loose of leads.

Reinforced elements with closed ends.

### MODEL RDO-14-83—The new DOUBLE-O for UHF may be ordered as a separate unit. Features include:

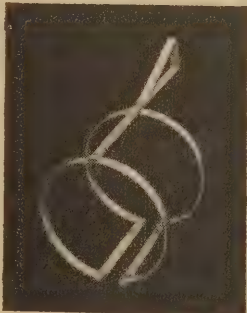
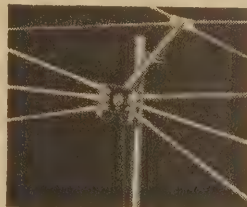
2 circle antennas fed 90 degrees out of phase with a gain of 3.8 db, plus 1 db gain over a single dipole in each of 2 circles for an overall gain in forward direction of 5.8 db.

The Double-O uses air as the dielectric and is supported at a current node (ground potential).

Greater directivity along a horizontal plane.

Low pickup response in vertical directions.

Noise and multipath reflections cancelled out at feed-point.



Rytel

RYTEL ELECTRONICS MFG. CO.  
9820 Irwin Avenue • Inglewood, California

Also connector clips, impedance matches, tube reactivators, tube-pullers, etc. Over 700 Rytel distributors in the United States. Write for further information.

sound-take-off coil and the FM-detector-transformer primary and secondary are to be peaked with the 4.5-mc signal. The precision required in this operation is shown in the following statement from an Admiral service manual (19A1): "Before proceeding, be sure to check the signal generator used in alignment against a crystal calibrator or other frequency standard for absolute frequency calibration at the 4.5-mc point. Accuracy required within one kilocycle." The 4.5-mc signal from this dual-crystal unit has the required accuracy (.02% of 4.5 mc = .0002 × 4,500,000 = 0.9 kc) and eliminates all need for additional equipment or special frequency checking in this important operation.

### Finding fractional frequencies

For extreme precision in tuning individual i.f. coils and traps, or in experimental design work with wideband television- or radar-i.f. amplifiers, this

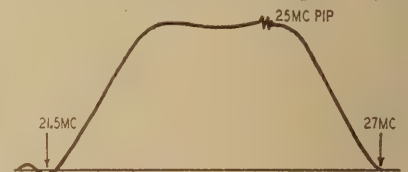


Fig. 3—Typical i.f. response curve with 25-mc marker pip from crystal calibrator.

unit allows the technician or experimenter to set an ordinary tunable marker generator to hair-line fractional-megacycle values. Suppose a certain i.f. stage must be peaked at exactly 22.3 mc. An ordinary signal generator set at this frequency may be putting out a signal anywhere be-

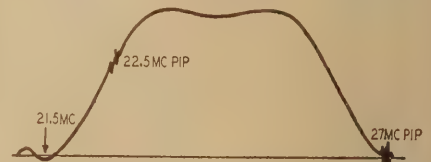


Fig. 4—Two marker pips from the 4.5-mc crystal show i.f.-amplifier bandwidth.

tween 22 and 23 mc. But if the output of this external generator is applied to the circuit under test along with the sweep and the 0.5-mc pips from the crystal oscillator-mixer, the tunable marker pip may be set visually at a point between the 22.0- and the 22.5-mc crystal pips corresponding in frequency to 22.3 mc. This can generally be done with very great accuracy.

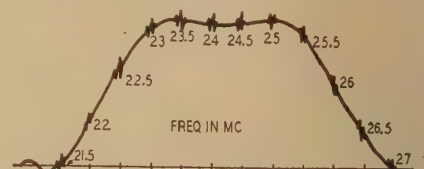


Fig. 5—With both crystals in operation the over-all response curve shows accurate marker pips every half-megacycle.

This dual crystal marker unit installed in your sweep generator will convert it into an instrument of laboratory precision at the cost of about ten dollars and a few hours construction time.

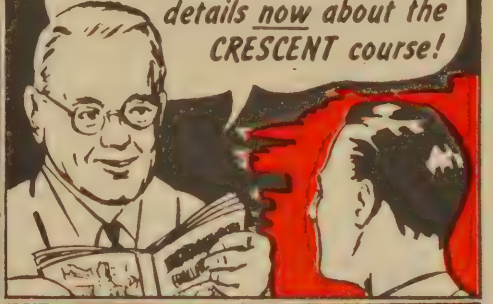
END



Now I've got a  
**HIGH PAYING CAREER in**  
**TELEVISION**  
**RADIO & ELECTRONICS**  
—thanks to the famous  
**CRESCENT SCHOOL**  
Home Study Course!



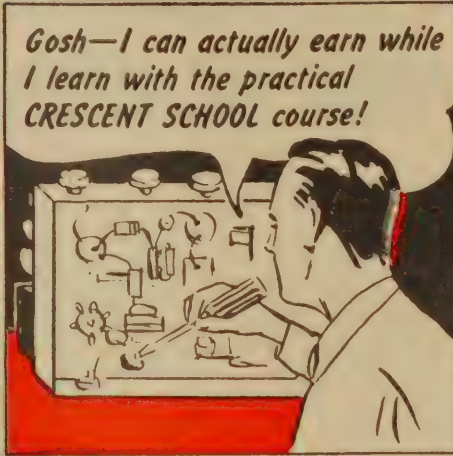
Yes, a brilliant future  
awaits you in **TELEVISION**.  
My advice is to send for the  
details now about the  
**CRESCENT** course!



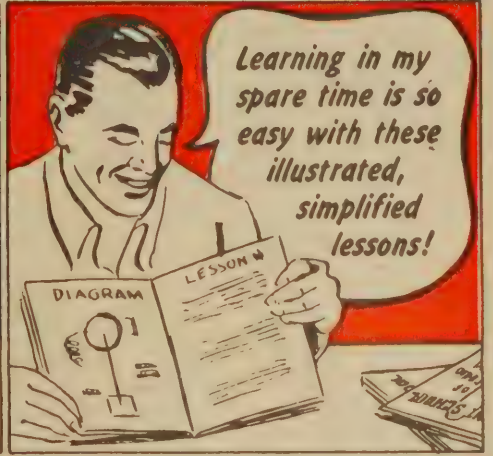
It's the **CRESCENT**  
**SCHOOL**  
**FREE** sample  
lesson. Boy!  
That was fast!



Gosh—I can actually earn while  
I learn with the practical  
**CRESCENT SCHOOL** course!



Learning in my  
spare time is so  
easy with these  
illustrated,  
simplified  
lessons!



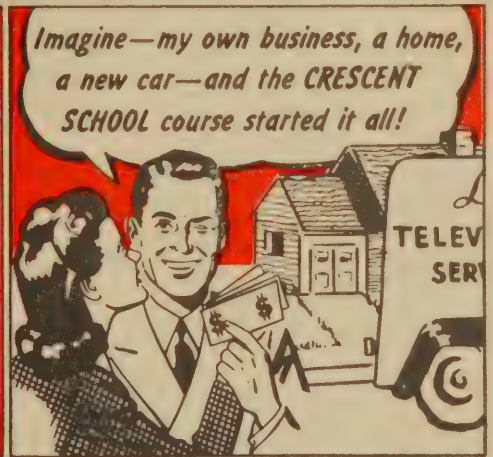
Wow! I built this swell TV  
set myself with my complete  
**CRESCENT** kits!



I'm sure proud of my  
**CRESCENT SCHOOL** certificate  
... now I can really start  
on a big career!



Imagine—my own business, a home,  
a new car—and the **CRESCENT**  
**SCHOOL** course started it all!



Also Day and Evening Classes  
Trained at our School.

Approved under the G.I. Bill,  
**CRESCENT SCHOOL** has trained  
thousands for BIG careers in the  
fast-growing **TELEVISION**  
industry.



**CRESCENT SCHOOL**  
"One of the largest  
schools of its kind"

**ACT TODAY** to start on a profitable  
career in **TELEVISION!**  
Get your  
sample lesson **FREE!**

**SEND COUPON TODAY!**

**CRESCENT SCHOOL** Dept. E1  
500 Pacific St., B'klyn 17, N. Y.

Sirs: Rush your **FREE** sample lesson and full details about  
the **CRESCENT SCHOOL** Course—at no obligation to me!

☐ Home Study Course ☐ Residential Course

NAME .....

ADDRESS .....

CITY.....ZONE.....STATE.....





high  
**HICKOK**  
sensitivity

**5** Inch  
**OSCILLOGRAPH**  
with DC  
**AMPLIFIERS**

### Model 670

Accurate television service requires a GOOD 'Scope. This HICKOK 670, designed with D. C. amplifiers provides excellent square wave response on both high and low frequency. The extra sensitivity in this HICKOK 670, properly shows the response curve, even when TV receiver is far out of alignment.

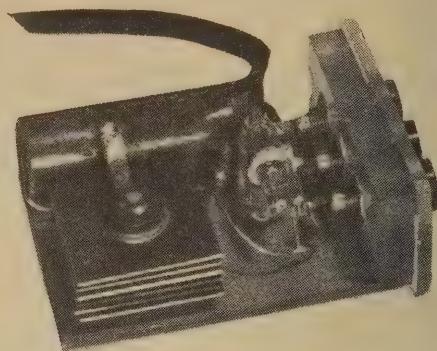
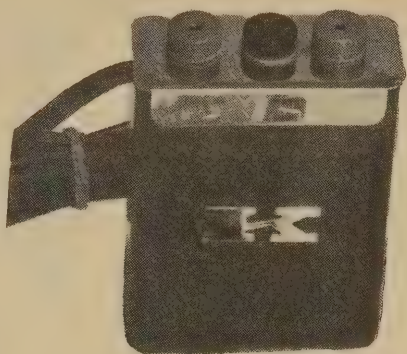
#### Look At These

#### FEATURES:

- Wide band vertical amplifier—flat to 600 KC, within 3 db, usable to beyond 5 MC.
- Horizontal amplifier 0 to 250 KC.
- Astigmatic focus control provides new standard in trace sharpness.
- Excellent square wave response on both high and low frequency.
- Reversing switches for both horizontal and vertical deflection.
- Fixed sweep frequency for accurate viewing of TV wave forms 30 and 7875 cycles.
- Recurrent linear sweep 3 cycles to 50,000 cycles.
- Direct coupled, balanced (push-pull) amplifiers for vertical and horizontal deflection.
- Line frequency phasing control (approx. 180°).
- Direct connection to horizontal and vertical plates of CR tube.
- Demodulator circuit for viewing modulation on RF signal.
- Negative and positive synchronizing.
- Provision for Z-axis modulation.

You'll like this HICKOK 670. It's a perfect companion to the HICKOK 610A for accurate TV alignment. Write for complete technical details TODAY!

**THE HICKOK ELECTRICAL INSTRUMENT CO.**  
10531 Dupont Avenue • Cleveland 8, Ohio



Two views of the capacitor checker. It is built into a plastic cigarette case.

## QUICK CAPACITOR CHECKER

By GEORGE KELLY\*

**S**PEED is one of the first essentials in profitable servicing. Here is a pocket-sized checker that not only speeds your work but makes many tests that cannot be made with an ordinary meter. It shows open, shorted, or intermittent capacitors, leaky electrolytics, and circuit continuity. In addition it indicates whether voltage in a circuit is a.c. or d.c.

Fig. 1 shows the extremely simple circuit. The checker can be built bread-board style, or can be fitted into a plastic cigarette case (as above). If the case has a metal top the pin jacks can be mounted as shown, with the insulating shoulder washers usually supplied. If you like, a plastic top may be substituted. Mount the rectifier, capacitor, and tie lug on a small piece of bakelite or plastic, then wire in the neon lamp, resistors, and line cord. Make a small notch in the side of the case to pass the line cord.

The circuit can be checked after wiring by connecting a jumper between the red and black pin jacks, and plugging the unit into the line. The neon lamp should glow brightly. Slip the unit into the case and it is ready for use. Make two suitable test leads with insulated phone tips for the checker pin jacks at one end, and alligator clips at the other.

#### Using the checker

To check paper, mica, or ceramic capacitors, disconnect one side of the capacitor completely from the circuit, connect the test leads to the red and black pin jacks, and plug the checker into the line. Good capacitors will show a single flash on the initial charge. (With small capacitance values the flash will be faint.) Intermittent or repeated flashing indicates leakage. If the neon lamp glows steadily the capacitor is shorted. There will be no flash or glow at all if the capacitor is open.

The output of the power supply is approximately 155 volts d.c. with 117-volt a.c. input. Do not use the checker

on any capacitor rated at less than 150 volts or on any equipment that is grounded or connected to the power line.

When checking electrolytic capacitors, polarity as well as working voltage must be observed. The red jack is connected to the positive side of the capacitor. The bulb will glow brightly at first, and as the capacitor charges this glow will grow dimmer until the bulb goes out. If the lamp flashes more than once per second, the electrolytic is too leaky to trust in a circuit. Flashes at the rate of one per second or longer are normal, as all electrolytics have a small leakage current.

This unit can indicate a leakage of over 300 megohms, and can be used for many types of continuity checks where an accurate resistance measurement is not required.

When using the instrument for continuity checks on resistors, appliances, or ignition systems, the lamp should

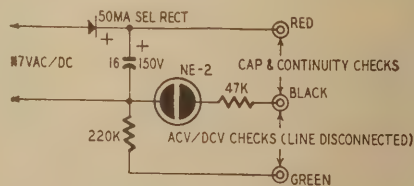
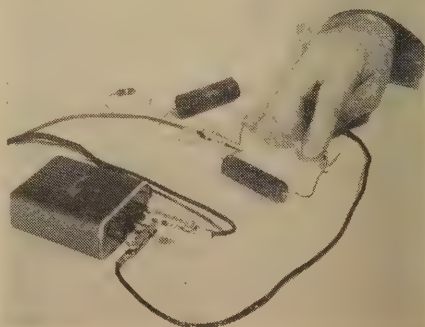


Fig. 1—The checker uses few parts.



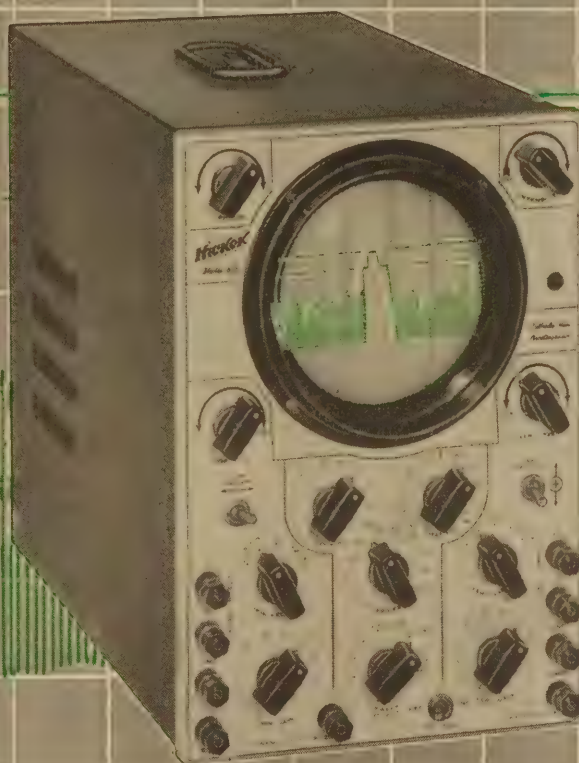
How it is set up to check a capacitor.  
RADIO-ELECTRONICS

\*Supervisor, de Forest's Training, Inc., Chicago, Ill.



# HICKOK

## Laboratory Quality



Model 670

In modern design testing, visual analysis of basic phenomena is constantly growing in importance. Applications are so numerous they are beyond comprehension.

At HICKOK, Expert Engineering Experience is backed by over 42 years of achievement in the manufacture of fine quality electronic equipment.

The 670 Oscillograph shown has DC Amplifiers flat response to 600 kc, within 3 db, usable to 5 mc, and provides excellent square wave response on both high and low frequency.

**THE HICKOK ELECTRICAL INSTRUMENT COMPANY**

10514 Dupont Avenue

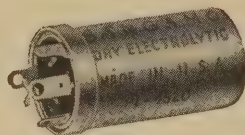
• Cleveland 8, Ohio





Once you make contact with a jobber or distributor who handles the complete line of Sangamo Type PL "Twist-Tab" electrolytics, you will never again have to "shop around" for odd sizes or capacities. Why? ... because the Sangamo line is the most complete in the industry.

Used by all leading manufacturers of TV sets, Sangamo Type PL "Twist-Tab" electrolytics are exact replacements. They assure long life and dependable performance at 85° C and under conditions of high surge voltages and extreme ripple currents often found in TV applications.



Ask your distributor for a copy of the Sangamo TV Replacement Catalog. It's easy to use and helps you choose the right replacement every time.

Deal with your Sangamo "Headquarters."

*Those who know ... choose Sangamo*



**SANGAMO ELECTRIC CO.** MARION ILLINOIS

#### PRES-PROBE CONDENSER TESTER

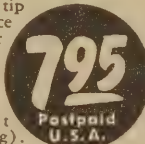
**Finds Intermittent  
Condensers Instantly**

Pres-probe's sliding tip with variable resistance prevents condenser heating. Tests with power on. Requires no adjustment. Stops guesswork. Saves time. Convenient probe size (7 1/4" long). Satisfaction guaranteed.

See Your Dist. or Order Direct

**PRES-PROBE CO.**

4034 N. Sixth St., Milwaukee 12, Wisc.

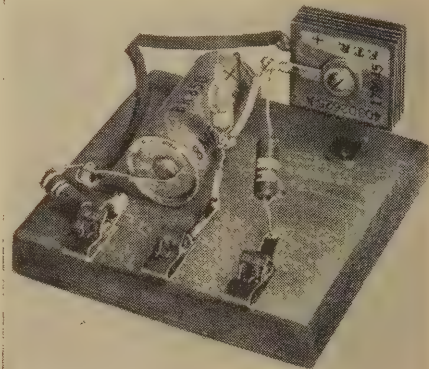


**\$3.00 FOR CARTOON IDEAS**  
RADIO-ELECTRONICS prints several radio cartoons every month. Readers are invited to contribute humorous radio ideas which can be used in cartoon form. It is not necessary that you draw a sketch, unless you wish.

**Address  
RADIO-CARTOONS,  
RADIO-ELECTRONICS  
25 West Broadway,  
New York 7, N. Y.**

show a steady glow. The glow will be less bright with high circuit resistances. This provides an excellent test for the quality of the capacitor in auto ignition systems.

The checker also will test the electrical continuity of photoflash bulbs without discharging them. This will often save good flash bulbs which did not fire because of low battery voltage or defects in the flash-gun or shutter switch. A good flash bulb produces a steady glow.



The checker set up in breadboard form.

The green and black pin are used for voltage checks. The unit should not be plugged into the line for these checks. When the glow surrounds both electrodes in the neon bulb, the circuit voltage is a.c. The lamp will ignite on 65 volts and operate up to 500 volts. Only one electrode glows on d.c., igniting at 90 volts and operating up to 500 volts.

The unit also will indicate the presence of r.f. voltage around a transmitter circuit by merely bringing a single lead near the circuit while holding the other lead in the hand. *Caution:* Do not make an actual connection to the circuit or to the a.c. line in this case.

(This little gadget was tried out by one of the editors of RADIO-ELECTRONICS and shown to students at one of the largest radio and TV schools in New York. It made such a hit that over 500 were turned out in less than a month, and each new enrollee insists on building one as soon as he learns the difference between a resistor and a capacitor.

Some handy modifications were worked out by the more ingenious students. One was to add a compact d.p.d.t. slide switch with one section in series with the a.c. line, and the other section across the red and black output terminals. With the line switch open, the other section shorts the output terminals and discharges both the internal filter capacitor and the capacitor being tested. This eliminates the danger of a shock from the test leads even with the line disconnected, since the electrolytic filter capacitor will retain its charge of 150 volts or more for a considerable time.

Another refinement was the addition of a detachable line cord. A standard television "cheater" receptacle fits neatly in the side of the case, and allows the cord to do double duty.) END

RADIO-ELECTRONICS



# DEALERS GETTING WESTINGHOUSE TUBES PROFIT FROM HEAVY LOCAL ADVERTISING AT NO COST

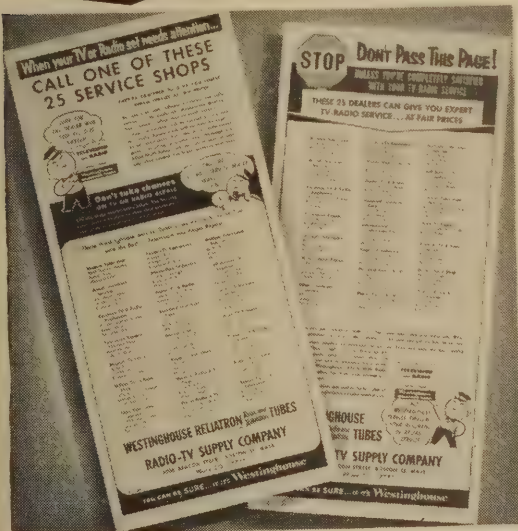
Service dealers are getting powerful local advertising support from new Westinghouse RELIATRON™ Tube Distributors. In cities now served by Westinghouse Distributors, dealers get local newspaper advertising, a complete kit of store display and imprinted mailing material.

All of it—local ads and kits—are designed to build TV-radio service business in the dealer's local area.

Best of all, none of it costs the dealer a penny!

You can get your store listed in two local newspaper ads at no charge, and get a kit to boot. If Westinghouse Tubes are now sold in your area, see your Westinghouse Distributor and take advantage of this \$900-worth-of-advertising-at-no-cost offer.

**NEWSPAPER ADS**



## COMING YOUR WAY

If Westinghouse Tubes are not yet distributed in your area, be patient. Distributors are being established in all market areas as fast as product availability and good service permit.

You'll soon have the chance to buy RELIATRON Tubes. Keep this tremendous opportunity in mind: you'll get newspaper advertising at no cost! Imprinted material for mailings! Imprinted signs for your window!

All of it is local advertising which sells your service in your own area where it counts.

For the name of your Westinghouse Distributor, or the approximate date when Westinghouse Tubes will be available in your area, drop a postal card to Dept. H-201 or have your regular distributor contact Dept. H-201 for information on how he can better serve you.

# RELIATRON™ TUBES

ELECTRONIC  
TUBE DIVISION

Westinghouse Electric Corporation  
Box 284, Elmira, N. Y.

YOU CAN BE SURE...IF IT'S  
**Westinghouse**



## TOP-SELLING TV-RADIO PUBLICATIONS distributed by HOWARD W. SAMS & CO., INC.

### COYNE

#### FAMOUS SHOP-TESTED REFERENCE BOOKS

##### "Latest Testing Instruments for Servicing Radio-TV"

New 1952 edition tells all about modern electronic testing equipment and how to use it most effectively. Packed with money-making short-cuts on trouble-shooting, servicing, construction and other subjects involving use of test instruments. Covers Multipliers, Resistors, Ohmmeters, Oscilloscopes, etc. All data shop-tested for practical application. Profusely illustrated, 350 pages. ORDER CTB-3. Only.....\$3.25



##### "TV Servicing Cyclopedica"—A Best Seller

The fact-packed TV reference book by H. P. Manly. Covers every phase of TV, including latest data on color and UHF. Shows you how TV works, how to service sets. Special sections on picture pattern servicing; testing and measuring; alignment; full treatment of amplifiers, antennas, controls, ion traps, sync. circuits, power supplies, video IF amplifiers, sweep oscillators, adapters, converters—covers everything. 750 pages. ORDER CTB-1. Only.....\$5.95



##### "Television and Radio Handbook"

1952 edition of the famous TV and radio "answer" book. Over 3000 facts packed into a single volume to speed trouble-shooting. Covers solutions to most frequent TV-radio service troubles; offers short-cut time-saving tips; data on TV boosters, latest UHF conversion methods, etc. 375 pages, hundreds of illustrations. ORDER CTB-5. Only.....\$2.75



### BOYCE

#### AUTHORITATIVE TV & RADIO HANDBOOKS

##### "Video Handbook"

Covers entire subject of TV; gives expert data on design, construction, operation and servicing. Fourteen complete sections cover the field of TV exhaustively. All subjects treated practically and simply for easy understanding. A remarkable handbook widely used by schools, engineers, experimenters, and industrial technicians. 892 pages. ORDER BB-2. Only.....\$5.95



##### "Radio and Electronics Handbook"

Here is the basic knowledge and data of Radio and Electronics digested in 18 sections; complete, easy-to-locate data. Clearly explains radio and electronic theory, and covers all phases of the subject in detail. The most widely used handbook of its kind—absolutely invaluable to anyone interested in radio or electronics. 890 pages; illustrated. ORDER BB-1. Only.....\$4.95



## HOWARD W. SAMS & CO., INC.

Order from your Parts Jobber today, or write direct to Howard W. Sams & Co., Inc. 2205 East 46th St., Indianapolis 5, Ind.

\$.....enclosed. Send the following books:

☐ CTB-3 ☐ CTB-1 ☐ CTB-5  
☐ BB-2 ☐ BB-1

Name.....

Address.....

City.....Zone.....State.....

## POLARIZED POWER PLUGS FOR THE EXPERIMENTER

By L. B. HEDGE

"A POLARIZED plug makes certain that the chassis is always grounded through the a.c. supply," I told a friend, recently, while explaining a new gadget in my shop. I was surprised to have him reply: "But who wants to buy polarized a.c. receptacles for all the places he may want to plug the thing in?"

I say his reply surprised me—it would not surprise me now, because, after questioning many friends and acquaintances and reading through a variety of electrical engineers' and electricians' handbooks, practical wiring manuals, fixture and appliance catalogs, and all manner of related publications, I find that few people seem to know, and few publications mention the fact, that *virtually all power receptacles and convenience outlets used on ordinary a.c. installations are polarized*. If you're as skeptical of this statement as most of my friends were, look at the receptacles in the room you're in—they're polarized if one slot is longer than the other. The opening which gives access to the white metal (grounded) contact should be not less than 0.045 inch (about 3/64 inch) longer than the slot to the dark metal (hot) contact. (Fig. 1.)

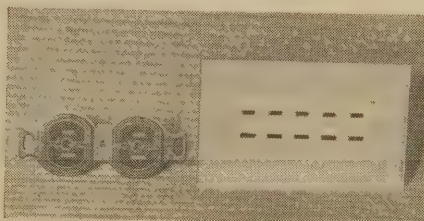


Fig. 1—Practically all modern outlets are polarized with the wider blade tied to the grounded side of the line.

Polarized plugs—plugs which will enter these receptacles only when correctly oriented—are obtainable from most electrical supply houses on special order, and a few of the larger ones will have them in stock. An ordinary (non-polarized) plug can be easily polarized, however, by soldering a U-shaped piece of wire around one of its blades to increase its width. The large loop of an ordinary paper clip (Fig. 2) serves well

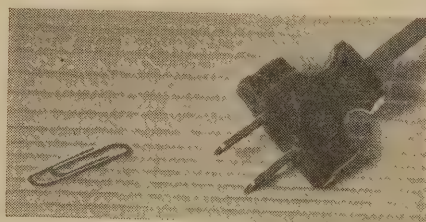


Fig. 2—Paper clip soldered around the edge of one prong polarizes the plug.

for this purpose. Cut it to length; fit it around the edge of one blade of your plug; back the blade with an asbestos

**IT'S NEW**

**10-POUND PORTABLE BATTERY-OPERATED TAPE RECORDER**

Write today for **Magnemite® literature**

4 models

priced

from

\$225

Model

610-B

8½ in. D.

5½ in. H.

11½ in. W.

### MAGNEMITE®

#### NEW DRY BATTERY

Inexpensive flashlight-cells that last 100 hours

#### NEW SPRING MOTOR

Governor-controlled motor runs 15 minutes per winding

#### NEW TAPE PLAYBACK

Playback and monitoring through earphones or ext. amplifier

#### NEW SENSITIVITY

Crystal-clear recordings to 100 feet from microphone

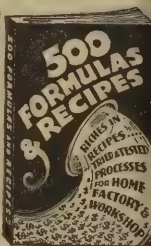
**AMPLIFIER CORP. of AMERICA**

398 Broadway

New York 13, N. Y.

## 500 FORMULAS TO SUCCESS

MANY million dollar firms started with a single formula, for which they paid a big price. Here you have 500—no less—tried and tested formulas, recipes and processes for making things... all at the ridiculously low price of 25¢. Here is your opportunity to start a business with but a few dollars' capital and with undreamed of profits in prospect. You can also use these formulas in your own home to cut household expenses to the bone. Or you can put them to use in your workshop to cut costs as much as 100%. Quit paying out many dollars in profits to manufacturers, wholesalers, and dealers, when you can make the same thing yourself for a few cents. It's so easy when you follow our simple instructions.



66 PAGES, 47,000 WORDS IN TEXT  
Send for "500 FORMULAS AND RECIPES" today. Enclose 25¢, that's all! You won't be asked for another cent now or later. Sold on a money-back guarantee.

## NATIONAL PLANS COMPANY

1966R Broadway, New York 23, N. Y.

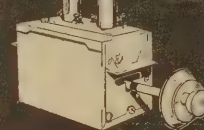
### HI-GAIN TUNER-BOOSTER

LESS TUBES WITH DIAL

**\$4.75**

COMPLETE WITH TUBES

**\$6.00**



Solve poor T.V. reception with a Hi-Gain Booster. Banish weak fringe areas, reduce snow. This unit comes to you as a highly serviceable High-Gain Tuner. Uses 6J6 Tubes in very efficient Hi-Q Circuit. Has 8 tuned circuits using pure silver inductances and individual compensation providing high gain on all channels. Built in 5:1 Vernier Drive. This is a complete departure from ordinary tuners.

All necessary parts and instructions are included to convert this unit in a few minutes to one of the highest gain boosters on the market regardless of price.

#### 100 ASSORTED RESISTORS

Carbon insulated. New in current RMA Values 5%, 10% and 20% in ½, 1 and 2 watt. \$2.00

Shipments sent postpaid when full payment is enclosed with order.

25% deposit on C.O.D. shipments.

Open account privileges to rated firms.

Send for our new bulletin listing many T.V. Components at terrific price reductions.

### DE CRAY AND ASSOCIATES

11842 W. Jefferson Boulevard Culver City, California

When writing to advertisers please mention  
**RADIO ELECTRONICS**

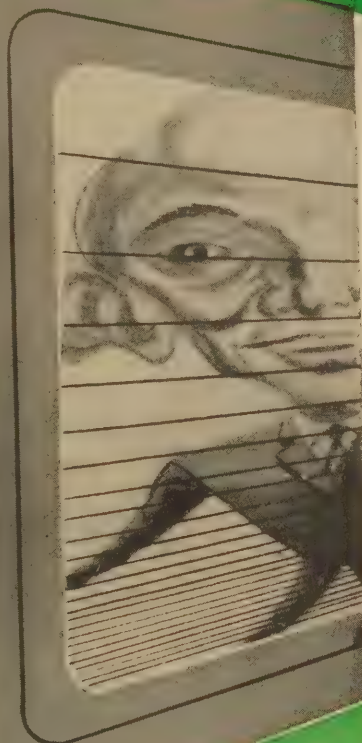


*make  
on-the-spot  
accurate  
linearity adjustments  
with new  
incomparable*

# RMS

PORTABLE BAR  
GENERATOR

only  
**24.<sup>90</sup>** *list*



MODEL BAR-1

Monster from Mars? *Not* no; just linearity out of adjustment . . . and you have no test pattern to aid you. Out of your kit comes your RMS Bar Generator . . . in a matter of minutes the job is done *accurately*. Your savings in eliminating "call backs" *more* than makes up the unbelievably low cost of this truly fine instrument.

- Provides adjustable number of both vertical and horizontal bars for easier alignment.
- Complete integral unit with no other equipment required.
- Ceramic condensers and other high quality components throughout.
- Treat yourself today . . . to A much finer instrument at a much lower price!

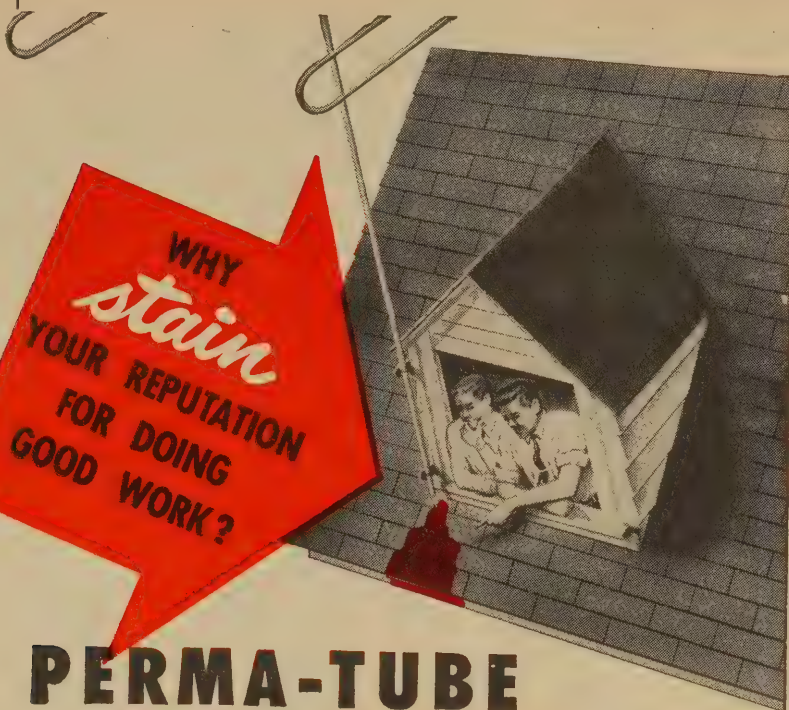


**RMS**

2014 BRONXDALE AVE.  
NEW YORK 60, N. Y.

SEE  
YOUR  
LOCAL  
JOBBER





## PERMA-TUBE

### TV MASTS Are Corrosion-Proofed INSIDE AND OUT

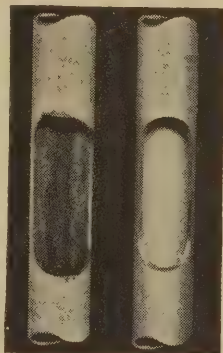
It's said you can't tell a book by its cover. And it's tough to tell what's going on inside a TV mast until rust and water from corrosion leave an ugly streak on the roof or house wall—then it's too late.

That's one reason smart service men are guarding their reputations for good work by installing J&L PERMA-TUBE TV masts. PERMA-TUBE is completely protected against corrosion by being pre-treated with vinsynite and coated *inside and out* with an exclusive metallic-pigmented vinyl resin base. In addition—PERMA-TUBE is made of special high-strength J&L steel that stays up in storms that would flatten masts made of ordinary conduit and other types of tubing.

You can obtain PERMA-TUBE in standard lengths, diameters and wall thicknesses. It's easy and economical to install—PERMA-TUBE's new POSITIONED-FITTED joints can be slipped together in a matter of seconds.

#### HERE'S INSIDE INFORMATION ON WHAT CORROSION DOES

→  
Section of ordinary conduit tubing used for TV masts after 96 hours in a salt spray test (A.S.T.M. Designation B-117-49T) to accelerate corrosion. Extensive rust inside the mast has reduced strength—caused rusty water to drain onto the owner's home.



←  
Section of PERMA-TUBE after 500 hours salt spray test shows no evidence of corrosion. Strength has been retained and the chance of rust streaks on owner's home are eliminated. Note sturdier wall thickness of Perma-tube sample.

#### FOR COMPLETE INFORMATION—MAIL THIS COUPON TODAY

Jones & Laughlin Steel Corporation  
496 Gateway Center  
Pittsburgh 30, Pa.

Without charge, please send me: ☐ Name of Nearest distributor  
☐ Complete information on Perma-tube

NAME \_\_\_\_\_  
COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
\_\_\_\_\_

sheet (Fig. 3) and solder it on. Clean off the extra solder and open up the hole in the blade and you have a first-class polarized plug (Fig. 4)—it will not go wrong-way-to into the receptacle. You can convert a dozen plugs this way in half an hour and the whole conversion will only cost a few cents.

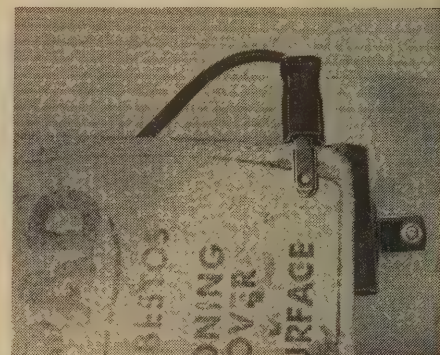


Fig. 3—How plug is held for soldering.

In view of the widespread ignorance of the polarization of receptacles, it will be wise for you to check the wiring on those with which you plan to use polarized plugs. A neon tester or an a.c. voltmeter—even a lamp with test leads attached—with one side grounded (to a water pipe if your outlet is not a metal conduit and box system, to one of the mounting screws into the box if the conduit and boxes are grounded) will identify the hot side. The short slot should



Fig. 4—The completed polarized plug.

be the hot one.

While you're doing this work it's not a bad idea to check all of the outlets in the house, reversing those you find improperly connected. With this done you can put polarized plugs on any hot frame or chassis devices you have and you'll be sure they're shockproof. This treatment will probably cure some of your humming audio gadgets—at least it will simplify the filtering necessary to eliminate the hum—and it will add stability to oscillators, v.t. voltmeters, and similar test gear that is not permanently wired into the 117-volt supply.

END

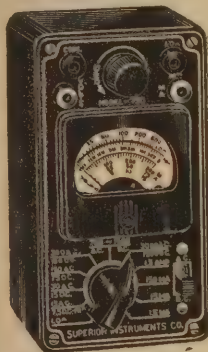


# BUY TEST EQUIPMENT ON THIS RADICALLY NEW TIME PAYMENT PLAN

## NO INTEREST!! - NO CARRYING CHARGES!!

USE CONVENIENT TIME PAYMENT ORDER BLANK BELOW

Superior's New  
Model 770



Model 770 is an accurate pocket-size V.O.M. Measures only 3/16" x 5/16" x 2 1/4".

## VOLT-OHM MILLIAMMETER

Sensitivity—1000 ohms per volt

Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. • Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. • Housed in round-cornered, molded case. • Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use.

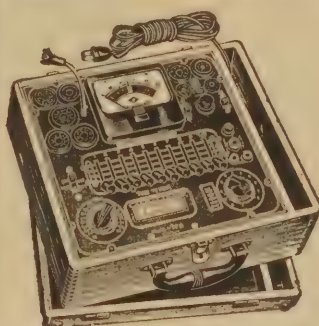
### SPECIFICATIONS:

- 6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 Volts.
- 6 D.C. VOLTAGE RANGES: 0-7.5/15/75/150/750/1500 Volts.
- 4 D.C. CURRENT RANGES: 0-1.5/15/150 MA. 0-1.5 Amps.
- 2 RESISTANCE RANGES: 0-500 Ohms 0-1 Megohm.

**\$14.90**  
NET

The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

Superior's New  
Model TV-11



Operates on 105-130 Volt 60 Cycles A.C. Hand-rubbed oak cabinet complete with portable cover

## TUBE TESTER

• Uses the new self-cleaning Lever Action Switches for individual element testing. Because all elements are numbered according to pin number in the RMA base numbering system, the user can instantly identify which element is under test. Tubes having tapped filaments and tubes with filaments terminating in more than one pin are truly tested with the Model TV-11 as any of the pins may be placed in the neutral position when necessary. • Uses no combination type sockets. Instead individual sockets are used for each type of tube. Thus it is impossible to damage a tube by inserting it in the wrong socket. • Free-moving built-in roll chart provides complete data for all tubes. • Phono jack on front panel for plugging in either phones or external amplifier detects microphonic tubes or noise due to faulty elements and loose external connections.

**\$47.50**  
NET

Superior's New

## JUNIOR SUPER-METER

MOST COMPLETE AND COMPACT MULTI-SERVICE INSTRUMENT EVER DESIGNED

Measures:  
\* Voltage  
\* Capacity

\* Current  
\* Reactance  
\* Decibels

\* Resistance  
\* Inductance

Specifications: D.C. Volts: 0-7.5/75/150/750/1500 Volts. A.C. Volts: 0-15/150/300/1500/3000 Volts. Resistance: 0-10,000/100,000 ohms. 0-10 Megohms. D.C. Current: 0-7.5/75 Ma. 0-7.5 amps. Capacity: .001 Mfd.—2 Mfd. .1 Mfd.—20 Mfd. Electrolytic Leakage: Reads quality of electrolytics at 150 Volt test potential. Decibels: —10 Db to +18 Db. +10 Db to +38 Db. +38 Db. to +58 Db. Reactance: 15 ohms—25 K ohms 15 K ohms—2.5 Megohms. Inductance: .5 Henry—50 Henrys 30 Henrys—10 K Henrys. Plus Good-Bad scale for checking the quality of electrolytic condensers.

**\$21.40**  
NET

Handsome round cornered molded bakelite case 3 1/2" x 5 1/2" x 2 1/4" complete with all test leads and instructions

Superior's New

## TV BAR GENERATOR

THROWS AN ACTUAL BAR PATTERN ON ANY TV RECEIVER SCREEN!



TV Bar Generator comes complete with shielded leads and detailed operating instructions. Only

**\$39.95**  
NET

Connects direct to antenna post. No connection inside receiver.

Features—Can be used when no stations are on the air. • Provides linear patterns to adjust vertical and horizontal linearity • Provides vertical and horizontal sweep signals • Provides signal for testing video amplifiers.

Superior's New  
Model 670-A

## SUPER-METER

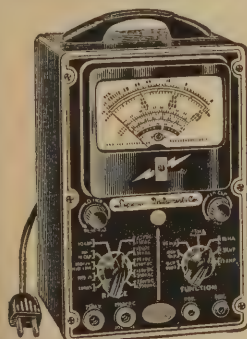
A combination volt-ohm milliammeter plus capacity reactance inductance and decibel measurements

### SPECIFICATIONS:

- D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts
- A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
- OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts
- D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes
- RESISTANCE: 0 to 1,000/100,000 Ohms 0 to 10 Megohms
- CAPACITY: .001 to 1 Mfd. 1 to 50 Mfd. (Quality test for electrolytics)
- REACTANCE: 50 to 2,500 Ohms 2,500 Ohms to 2.5 Megohms
- INDUCTANCE: .15 to 7 Henrys 7 to 7,000 Henrys
- DECIBELS: —8 to +18 +14 to +38 +34 to +58

**\$28.40**  
NET

ADDED FEATURE  
The Model 670-A includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 Volts.



Comes housed in rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 6 1/2" x 9 1/2" x 4 1/2".

## NEW TIME PAYMENT PLAN ORDER BLANK

MOSS ELECTRONIC DISTRIBUTING CO., INC.  
Dept. B-43, 38 Murray Street, New York 7, N. Y.

Please send me the units checked below. I am enclosing the down payment with order and agree to pay the monthly balance as shown. It is understood there will be no carrying, interest or any other charges, provided I send my monthly payments when due. It is further understood that should I fail to make payment when due, the full unpaid balance shall become immediately due and payable.

- ☐ MODEL 770 ..... Total Price \$14.90  
\$2.90 down payment. Balance \$2.00 monthly for 6 months.
- ☐ MODEL TV-11 ..... Total Price \$47.50  
\$11.50 down payment. Balance \$6.00 monthly for 6 months.
- ☐ JUNIOR SUPER METER ..... Total Price \$21.40  
\$5.40 down payment. Balance \$4.00 monthly for 4 months.
- ☐ TELEVISION BAR GENERATOR ..... Total Price \$39.95  
\$9.95 down payment. Balance \$5.00 monthly for 6 months.
- ☐ MODEL 670-A ..... Total Price \$28.40  
\$7.40 down payment. Balance \$3.50 monthly for 6 months.

☐ I enclose \$\_\_\_\_\_ as down payment.

☐ Ship C.O.D. for the down payment.

Signature\_\_\_\_\_

Name\_\_\_\_\_

Address\_\_\_\_\_

City\_\_\_\_\_ Zone\_\_\_\_\_ State\_\_\_\_\_



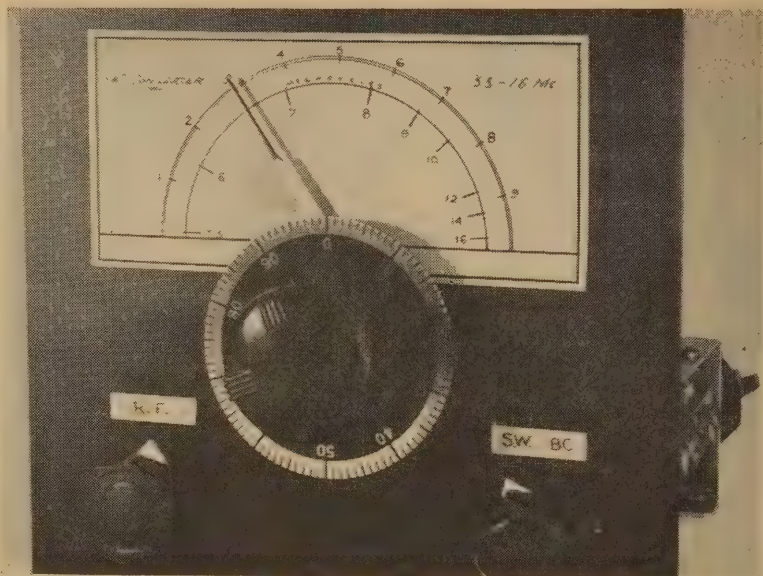
# RIDER TEK- FILE\*

easy-to-use  
packaged  
tv  
service  
information—  
it's  
complete...  
accurate...  
factory-  
authorized—  
at  
your  
jobbers  
now...  
only  
\$2 per pack

\*dependable replacement  
parts listing beginning  
with Pack 57

**JOHN F. RIDER**  
PUBLISHER, INC.

480 Canal Street,  
New York 13, N. Y.



Front-panel view of shortwave converter.

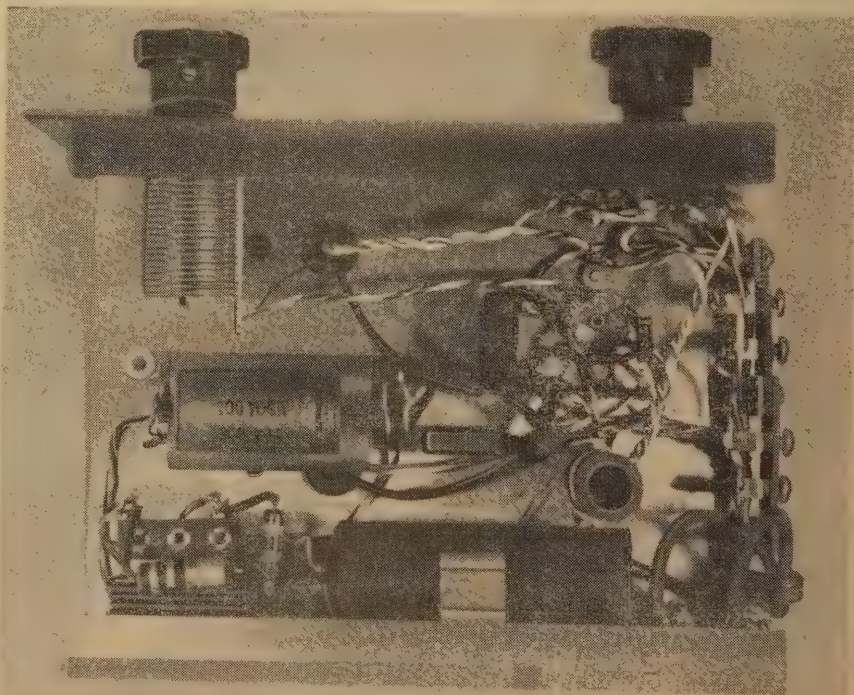
## SW CONVERTER

By RICHARD GRAHAM

THIS converter is a simple one-tube affair that will convert your present broadcast set to receive signals on the international short-wave broadcast bands, between 5.5 and 15 mc. With it you can break the chains that bind your set to the American broadcast band and multiply your listening enjoyment. Many fine educational, cultural, and musical programs can be heard daily. These originate in countries all over the world, including, of course, those from our own Voice of America stations. Many short-wave enthusiasts attempt to receive, identify,

and verify as many of these foreign stations as they can, and this is a use to which this converter is well suited.

Although the converter uses only one tube, its performance far exceeds that of the simple one- or two-tube receivers. This is because it takes advantage of the selectivity and sensitivity of your present broadcast set. The result is plenty of "snap." Its performance will generally be equal to the lower-priced communications receivers. Even when the converter was used with a cheap a.c.-d.c. set and a 4-foot antenna, the results were surprising. English, Amer-



The r.f. tuning capacitor is mounted underneath the chassis.

RADIO-ELECTRONICS



**SMASH  
HIT!**

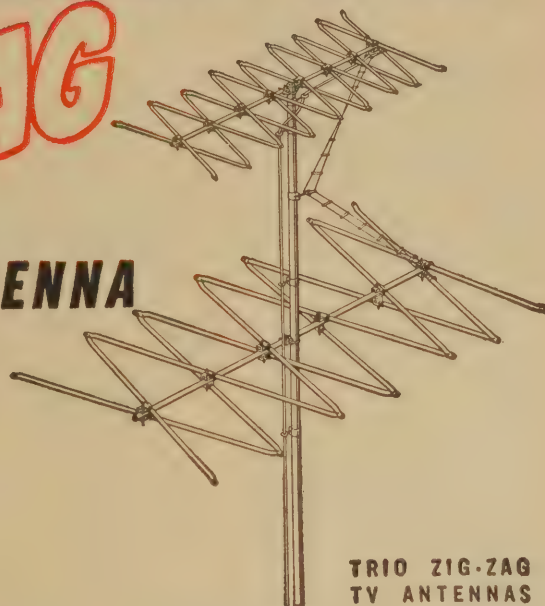
**TERRIFIC ACCEPTANCE GREETES THE NEW**

# **TRIO ZIG-ZAG** (Patent Pending) **TV ANTENNA**

The sensational new TRIO ZIG-ZAG TV ANTENNA has already proven its superiority in the field. Thousands of installations have given a new high in TV reception, especially in ultra-fringe areas. Word of mouth has done the rest. TRIO'S plant capacity, taxed to the limit in an effort to supply the amazing demand for the ZIG-ZAG ANTENNA series, is being greatly expanded. Very soon now, your ZIG-ZAG ANTENNA will be supplied, and it's well worth waiting for.

ZIG-ZAG ANTENNAS have replaced every known type of installation and TRIO is proud to report that in EVERY instance the ZIG-ZAG ANTENNA has out-performed them all, even the tried and true TRIO dual-channel yagi.

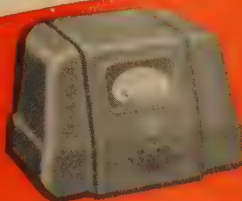
TV listeners are finding that with a ZIG-ZAG ANTENNA they are no longer tied down to just one or two channels, but are getting excellent reception on channels never seen before. ZIG-ZAG ANTENNA is truly HOT on all VHF channels.



**TRIO ZIG-ZAG  
TV ANTENNAS**

available in 8 different models, provide a new high in all-channel performance for any area, from metropolitan to ultra-fringe. Tremendous gain, sharp directivity, excellent match to 300 ohm line, sturdy vibration-proof construction and fast, easy installation tells the rest of the TRIO ZIG-ZAG ANTENNA story.

SEE THEM at your JOBBERS. WRITE for CATALOG.



## **TRIO ROTATOR**

A worthy companion to the ZIG-ZAG ANTENNA. Tested and proven under every conceivable condition of load, weather, strain and stress. Two motors, one for each rotation direction. Positive electrical stops prevent damage of over-rotation. Positive brake action, no drift even when supporting heavy arrays in 80 MPH winds. Precision built of finest materials and UNCONDITIONALLY GUARANTEED by TRIO for TWO YEARS. SMARTLY STYLED DIRECTION INDICATOR has easy to read dial face and easy to use finger touch control. A beautiful instrument you'll be proud to own.

These ZIG-ZAG ANTENNAS provide the ultimate in extreme fringe area reception. ZZ12L provides 12-14 db. gain on Channels 2 thru 6. ZZ16H has a gain of 14 db. on Channels 7 thru 13. These antennas have very narrow forward lobe, high front to back ratio, provide high rejection in areas with co-channel interference.



Where maximum gain is not necessary these normal fringe model ZIG-ZAG ANTENNAS are ideal. Model ZZ8L has a gain of 9 db. average on Channels 2 thru 6. The ZZ8H provides an 11 db. gain on Channels 7 thru 13. Forward lobe patterns comparable to good multi-element single channel yagi.



For near fringe area reception these ZIG-ZAG ANTENNA models provide 8-9 db. gains on all Channels 2 thru 13. ZZ6L covers Channels 2 thru 6 and Model ZZ6H covers Channels 7 thru 13. Both models have patterns similar to those of cut to channel yagis.



These ZIG-ZAG ANTENNAS provide ALL CHANNEL reception with only ONE antenna bay. Model ZZ6A is designed for near fringe area reception of all Channels 2 thru 13, with an average gain of 9 db. Model ZZ4A is for use in suburban areas, providing an average gain of 6 db. on all Channels 2 thru 13.



# **TRIO**

**TRIO MANUFACTURING COMPANY**

**GRIGGSVILLE, ILLINOIS**



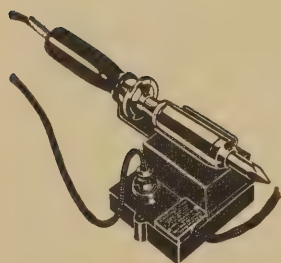


## American Beauty

### Electric Soldering Irons are Service Proven...

#### Since 1894

These features make American Beauty the Standard-of-Perfection on the world's production lines . . . where dependability, long life and efficiency are demanded.



TEMPERATURE REGULATING  
STAND

Thermostatically controlled to maintain heat of iron at any desired temperature while at rest.

- Nickel-coated, corrosion-resistant tips, easily and quickly replaced
- Super-flexible cord, American Beauty made, resists wear due to flexing
- Heating element of chrome-nickel ribbon resistance wire
- Insulated with pure mica
- Built-in adapter for ground wire

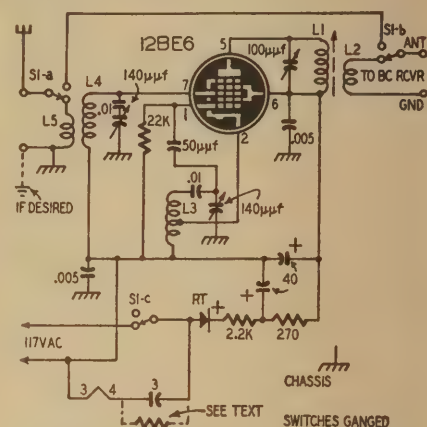
WRITE FOR FREE LITERATURE

**AMERICAN ELECTRICAL HEATER COMPANY**  
DETROIT 2, MICHIGAN

ican, and South American stations rolled in at full volume, actually overloading the speaker.

#### A superhet tuner

Circuitwise, the converter is very similar to the mixer circuit used in the front end of many superheterodyne receivers. It changes the short-wave signal to 1500 kc by beating it with another signal from an oscillator in the converter which is 1500 kc higher (or lower) than the received signal. Converting the short-wave signal to 1500 kc enables us to tune it in on any ordinary broadcast set.



Schematic of the 1-tube converter.

The broadcast receiver—which has been set to 1500 kc—then acts as the i.f., detector, and audio sections to complete the receiver. To avoid r.f. and oscillator tracking problems, which can be very nasty for a novice at these frequencies, the r.f. and oscillator capacitors are adjusted separately for best reception.

For economy reasons, the converter was made a.c.-d.c. To avoid serious shock, no connection is made to the chassis from the power line. But because the rotor of a variable capacitor is automatically grounded to the chassis when mounted on a panel and because of hand capacitance effects, it is necessary to ground the chassis to the line for r.f. The .005-µf capacitor between line and chassis and the .01-µf capacitors in series with the stators of the two variables isolate them from the line at 60 cycles while affecting them very little at frequencies between 5 and 15 mc. While it is still possible to get a "tickle" if the line plug is not polarized correctly, it will not be serious because of the high reactance of the capacitors at the power-line frequency of 60 cycles. The solution, of course, is simply to turn the plug over in the wall socket.

Another interesting feature is the use of a 3-µf capacitor in series with the filament to drop the line voltage to 12 volts for the 12BE6. This was actually made up of three 1-µf, 200-volt capacitors connected in parallel. These are seen in the left side of the photograph of the bottom wiring. If desired, a 697-ohm, 20-watt resistor can be substituted for the 3-µf capacitor. Since a capacitor does not dissipate power, the whole converter will consume about 2



# G-C

## YOUR HEADQUARTERS FOR THOUSANDS OF RADIO-TV SERVICE AIDS Products of the Month

G-C—the company that pioneered the radio-TV service aid field—now makes more products for servicemen (and more exclusive with G-C) than anyone else. Besides this variety, you get more quality, more value for your money. That's why it pays you to insist upon getting G-C products from your jobber . . . finer products like the ones shown on this page.



### G-C RADIO SERVICE CEMENT

High grade cement for radio and speaker work. Original and finest made; use for speakers, cones, spiders, loose grid caps and tube bases, etc. Water-proof, fast drying. Brush in cap.  
No. 30-2—2-oz. Bottle List 65c



### G-C DE-NOIZ CONTACT CLEANER

New secret ingredients dissolve corrosion and oxidation and stop noise on contacts, volume controls, tuners, detents, switches, relays, etc. Simply apply and forget, noise disappears. Applicator.  
No. 51-2—2-oz. Bottle List \$1.60



### G-C MAG-NETIK HEAD CLEANER

Cleans recording heads on tape and wire recorders. Nothing like it on market; original and best available. Removes oxide accumulation, cleans without leaving scum or residue. Renews head for improved recording and erasing. Use regularly. Applicator.  
No. 53-2—2-oz. Bottle List \$1.60



### G-C RED-X CORONA DOPE

New red colored corona dope to prevent corona shorts on TV sets. Fast drying. Same material as used by leading set manufacturers. Use on any high voltage circuit. Brush in cap.  
No. 50-2—2-oz. Bottle List \$1.20



### G-C TELEVISION TUBE KOAT

Fast-drying conductive coating for recoating outside of picture tubes where the surface is scratched or peeling. Nothing like it for TV service work. Brush in cap.  
No. 49-2—2-oz. Bottle List \$1.20



### G-C DUPLEX TUBE PIN STRAIGHTENER

Handiest tube pin straightener you ever saw! Straightens pins on both miniature and jumbo miniature tubes, both 7- and 9-pin types. Precision made steel dies molded in durable plastic.  
No. 8655 List \$2.50



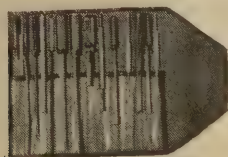
### G-C AMO MINIATURE TUBE PULLER

Exclusive with G-C, AMO prevents tube breakage and burned fingers, speeds up production and repair. Easy to operate, works on suction and vacuum. Press down on tube to pull, press button to release!  
List  
No. 5093 (for 7-pin tubes) \$1.65  
No. 8106 (for 9-pin tubes) \$1.65



### G-C SPEEDEX AUTOMATIC WIRE STRIPPER

New model, fully automatic with "delayed return action" to prevent crushing fine stranded wires. Single squeeze action strips both solid and stranded wire. Interchangeable blades. Other models.  
No. 766-1 List \$8.25



### G-C DELUXE TV ALIGNMENT TOOL KIT

Durable leatherette roll type case with 16 matched tools. Tools are finest quality, with steel tips of hardened spring steel; used and approved by leading TV set manufacturers. \$15.00 list value.  
No. 8280 List \$12.90



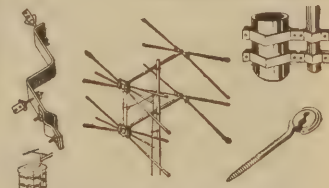
### G-C "HINGED COVER LINE" HARDWARE

New G-C 50 Line—240 items such as bolts, nuts, screws, grommets, etc.—packed in new, reusable, hinged cover plastic boxes. Save the label coupons, get a metal rack for stocking different boxes. Exclusive with G-C! Look for new G-C display at your jobber. List price per box only 50c.

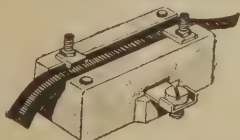


### G-C 3-WAY TV LINE KLIP

Sell this clever new item to every set owner, use it for store demonstration and servicing. Use it three ways—straight, side or plug-in (RCA sets). No soldering, attaches in seconds, quick disconnect in storms.  
No. 8744 List 50c



**G-C TV ANTENNAS-ACCESSORIES**  
G-C Master-Line Antennas are America's finest line, regardless of price. Matched line of stand-offs, chimney and wall mounts, connectors, etc., saves you time and money, gives you dependable TV antenna installation.



### G-C UNIVERSAL TV LIGHTNING ARRESTER

Underwriters' approved lightning arrester for both 300-ohm and 450-ohm open line, indoor and outdoor use. Safe, sure and speedy to install—proved best by test. No wires to strip, not affected by heat.  
No. 8640 List \$1.25

**FREE** Write today for G-C's big illustrated catalog plus new supplements. Shows all these G-C products and thousands more. Send a postcard right away. No obligation!



**GENERAL CEMENT MANUFACTURING Co.**  
910 Taylor Avenue Rockford, Illinois







Why use  
**Microwaves?**

Read  
**ESSENTIALS OF  
MICROWAVES**

By Robert B. Muchmore, *Hughes Aircraft Co.*  
An expert's practical survey of the physical principles of microwaves and applications of microwave equipment. Word-pictures replace complicated mathematics. September 1952. 236 pages. \$4.50.

Write for copy on 10-day approval

**JOHN WILEY & SONS, INC.**  
440 Fourth Avenue New York 16, N. Y.

## TIMESAVER!

### TELEVISION TECHNOTES—

Gernsback Library Book No. 46  
128 Pages. 58 Illustrations \$1.50

A real boon to TV service technicians. List the symptoms, causes and cures for 607 actual troubles found in scores of sets made by 27 manufacturers. Cuts down routine trouble-shooting time.



(Available at leading parts distributors)

**GERNSBACK PUBLICATIONS, INC.**  
Publishers of RADIO-ELECTRONICS  
25 West Broadway, New York 7, N. Y.

watts. With a resistor substituted for filament voltage dropping, the power consumption will be approximately 18 watts.

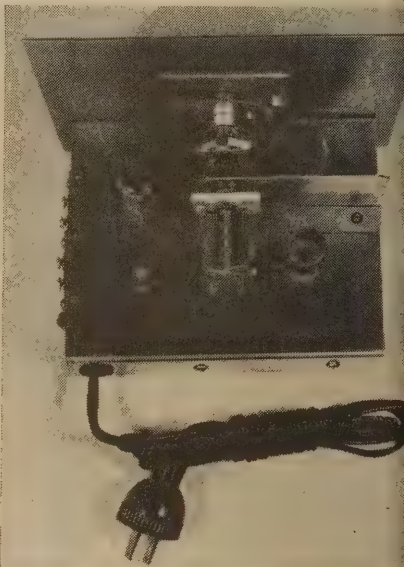
While there is nothing tricky or critical in the wiring of the unit, it is well to remember to keep all r.f. leads short and as direct as possible. Leads in this category would include those from the coils and variable capacitors. Other wiring such as the power supply circuit, filament, and other a.c. wiring may be conveniently wired and then cabled if desired. This is what was done in the unit shown.

Since the converter covers a rather wide band of frequencies, it is well for the constructor to invest in some sort of vernier dial. This will make tuning much easier and smoother. The dial shown in the unit constructed has been calibrated with both a 0—100 scale (for accurate logging) and a frequency scale. The dial can be calibrated by "on the air" observations and a radio log (available at most newsstands).

A word of caution concerning frequency calibration so the constructor may avoid a confusing pitfall. To make the unit simple, the r.f. and oscillator capacitors were tuned separately. Now, if an oscillator (for example) is set at 6 mc and the intermediate frequency is fixed at 1500 kc (1.5 mc), the incoming signal can be either on 6+1.5, which would be 7.5 mc, or 6-1.5, which would be 4.5 mc. The frequency that is selected is determined by the r.f. tuned circuit. In many instances the r.f. capacitor can be made to tune to either

frequency, as in the example above. Thus you can tune in two different signals at one dial setting of the oscillator capacitor. With the r.f. capacitor placed in furthest, the frequency will be lower of the two possible received frequencies. This is the best way of operating the converter, and should cause no confusion.

A switch S1 has been provided to switch the a.c. to the converter on or off simultaneously, to switch the antenna from the converter to the broadcast when the power to the converter is



Layout shows input-output coil shielded.

## Service MAN-SIZE INSTRUMENT VALUES at HUDSON!

IMMEDIATE DELIVERY

ON ALL **24**

WORLD-FAMOUS

**EICO**

INSTRUMENTS AND KITS

Only EICO gives you  
Laboratory Precision at Lowest Cost.  
You build EICO KITS in 1 evening, but  
... they last a lifetime. And you SAVE  
OVER 50%.

See the complete EICO line at HUDSON  
— or write for latest catalog NOW.

Hudson Radio & TV Corp. 48 W. 48 St., NYC R-1.

☐ Send me FREE 192-page 1953 Hudson Catalog

☐ Send me the following EICO Instruments:

- |  |  |
|--|--|
| <input type="checkbox"/> 425K Scope Kit \$44.95      | <input type="checkbox"/> 625K Tube Tester Kit \$34.95    |
| <input type="checkbox"/> #425 Wired \$79.95          | <input type="checkbox"/> #625 Wired \$49.95              |
| <input type="checkbox"/> 221K VTVM Kit \$25.95       | <input type="checkbox"/> 214K VTVM Kit \$34.95           |
| <input type="checkbox"/> #221 Wired \$49.95          | <input type="checkbox"/> #214 Wired \$34.95              |
| <input type="checkbox"/> 565K V-O-M Kit \$24.95      | <input type="checkbox"/> 377K Audio Gen. Kit \$31.95     |
| <input type="checkbox"/> #565 Wired \$29.95          | <input type="checkbox"/> #377 Wired \$49.95              |
| <input type="checkbox"/> 536K V-O-M Kit \$12.90      | <input type="checkbox"/> 1040K Battery Elim. Kit \$25.95 |
| <input type="checkbox"/> #536 Wired \$14.90          | <input type="checkbox"/> #1040 Wired \$34.95             |
| <input type="checkbox"/> 320K Sig. Gen. Kit \$19.95  | <input type="checkbox"/> 315K Deluxe Gen. Kit \$39.95    |
| <input type="checkbox"/> #320 Wired \$29.95          | <input type="checkbox"/> #315 Wired \$59.95              |
| <input type="checkbox"/> 360K Sweep Gen. Kit \$34.95 | <input type="checkbox"/> 145K Sig. Tracer Kit \$19.95    |
| <input type="checkbox"/> #360 Wired \$49.95          | <input type="checkbox"/> #145 Wired \$28.95              |

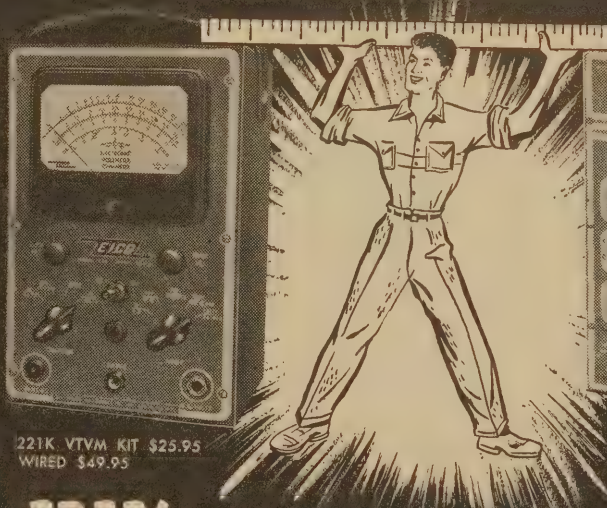
20% deposit required with all C.O.D. orders

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_



221K VTVM KIT \$25.95  
WIRED \$49.95

425K 5" PUSH-PULL SCOPE  
KIT \$44.95 WIRED \$79.95

## FREE! 1953 HUDSON CATALOG

Over 192 pages of electronic parts and equipment ... complete Hi-Fi Section ... JAN Cross-Reference Guide ... the industry's most valuable buying tool! Send for it today. Address Dept. R-1.

See EICO's other ads on pages 28 and inside back cover.

**HUDSON**  
RADIO & TELEVISION CORP.

48 West 48th Street, New York 36, N. Y.

212 Fulton Street, New York 7, N. Y.

Circle 6-4060



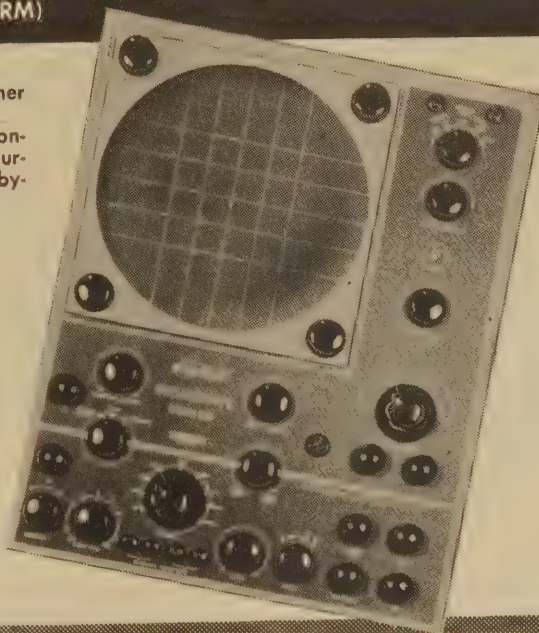
# NEW... AMAZING... OSCILLOSCOPE by precise

(IN KIT AND WIRED FORM)

**ACCEPT NO SUBSTITUTE—INSIST** on this latest PRECISE Original—No other "scope" can compare with this newest test instrument—**BECAUSE:** PRECISE uses **NO SURPLUS**—only the finest components in our precision-engineered products. PRECISE offers an iron-clad guaranty with every purchase. AND PRECISE gives you an instructively illustrated, 3 color, "step-by-step" construction book—the most comprehensive in the market today!

HERE ARE A FEW OF THE NUMEROUS PRECISE FEATURES IN THE NEW OSCILLOSCOPE:

1. True electronic sweep magnifier
2. Astigmatism control
3. Push-Pull vertical from input thru output; push-pull horizontal
4. Internal blanking and Z modulation with blanking amplifier
5. Driven and non-driven sweep
6. Over 5MC flat response—DC amplifiers
7. Cathode follower input on vertical and horizontal
8. Internal calibrator
9. Horizontal and vertical stepping attenuator
10. NEW 7" Tube to PRECISE specifications
11. Highest sensitivity available aside from finest laboratory scopes



## PRECISE TEST EQUIPMENT AVAILABLE IN KIT AND WIRED FORM



**MODEL 630 RF-AF-TV AND MARKER GENERATOR.** For the first time in the history of the industry... 50 MUCH FOR SO LITTLE 110 MC on fundamentals, 330 MC on harmonics; Pre-tuned RF (within 1%) head; AF from 20 to 20,000 cycles; variable % and Ext. Mod.; Cathode-follower and Constant Z output; Stepping attenuator; Speech Amp.; Xtal Marker with Amp. control; RF and AF Standby; Wien Bridge AF; Colpitts RF; Illuminated Drum Dials; Coax outputs; Separately tuned coils; Filtered AC; Vernier tuning; Separate RF; Shielded; 8" x 11" x 5"; Etched panel.

*Model 630KA	\$38.95 (pre-assembled head)	Model 630K
Model 630W	\$53.95 (Factory wired)	<b>\$33.95</b>



**MODEL 635 UNIVERSAL AF SINE, SQUARE AND PULSE GENERATOR.** For accurate testing audio and video circuits. 1% Ceramic precision resistors. Wien Bridge; variable Z and cathode-follower output; minimum overshoot and roundoff through 100,000 cycles; sine waves through 200 KC

	<b>\$33.50</b>
Factory wired	\$52.50



**MODEL 909 VACUUM TUBE VOLTMETER.** 1% Ceramic precision Resistors; Coax DC connector; FM zero alignment scale; burn-out proof circuit. Rugged oversize 4 1/2" meter

	<b>\$25.98</b>
Factory wired	\$44.98

FOR COMPLETE LINE  
OF  
PRECISE KITS  
MAIL COUPON BELOW

**MODEL 912 RF PROBE.** LOWEST PRICED, factory wired Probe in the industry. Individually calibrated at 75 MC for accuracy, impedance and shunt capacity.

	<b>\$4.25</b>
Wired Only	

**MODEL 960 CAPACITY ATTENUATOR PROBE.** Reduces input C. and loading effects of an oscilloscope by 10 to 1. Adjustable for any scope. Lowest priced in the field, but still using highest quality components.

	<b>\$5.95</b>
Wired Only	



Prices slightly higher in the West. Prices and specifications subject to change without notice.

**MODEL 907 DELUXE VACUUM TUBE VOLTMETER.** Another PRECISE first! Vertical or Horizontal construction. GIGANTIC 7 1/2" meter movement; all the unusual values and features of Model 909 in a really DELUXE version

	<b>\$38.98</b>
Factory wired	\$57.98



**MODEL 610 RF SIGNAL GENERATOR.** The lowest priced signal generator in the field offering:—Same RF head as Model 630; 110 MC on fundamentals; 330 MC on harmonics; 60 and 400 cycle AF; Cathode-follower output; Ext. Mod.; Speech Amp.; Individually tuned coils.

Model 610KA	\$28.95 (pre-assembled head)	Model 610K
Model 610W	\$39.95 (wired)	<b>\$23.95</b>

PRECISE DEVELOPMENT CORP. Dept. RE-13  
999 LONG BEACH ROAD • OCEANSIDE, L. I., NEW YORK

GENTLEMEN: Without any obligation on my part, kindly send me the following:

- ☐ PRECISE CATALOG  
☐ NAME OF DISTRIBUTOR NEAREST ME

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_

**precise DEVELOPMENT CORP.**  
OCEANSIDE, NEW YORK



FOR THE  
FIRST TIME  
Anywhere!

A BROAD BAND, 3 TUBE, 3 STAGE,  
FULLY AUTOMATIC BOOSTER WITH  
ALL-CHANNEL GAIN IN EXCESS OF 16 db.

and only \$39<sup>50</sup><sub>LIST</sub>

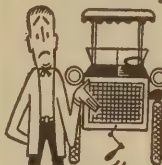
THE NEW **B-T**  
**BOOSTER**  
MODEL HA-3 Fully Automatic  
DESIGNED FOR BETTER TELEVISION

What John wanted most and found hard to get,  
Was a booster what boosted, with no knobs to set.



"Knobs," he complained, "makes tuning more tough,"  
And, "Lord knows", he cried, "My set has enough."

"And who needs more boxes to clutter the house?  
There's enough work around for me and my spouse."



"You'd laugh if I cranked my car like we useter,  
So why have old-fashioned knobs on a booster?"

But, John had a Tech-man who knew his TV  
Who showed John the booster made by B-T.



At last, John is happy, and more so to learn  
That the booster is hidden and no knobs to turn.

NO knobs to set.  
NO channel tuning.  
NO band-switching.

Lower noise factor.  
Attractive hammertone  
steel cabinet.



Write for  
Catalog EA3



**BLONDER-TONGUE LABORATORIES, INC.**  
WESTFIELD, NEW JERSEY

and vice versa. This is the SW—BC switch shown on the front panel of the converter. It is shown in the "converter" position in the schematic.

### Alignment and operation

After the unit is completed, it is necessary to align the converter by adjusting L1. All that is necessary is to hook up the unit to both the broadcast set and antenna as indicated in the schematic. Next turn the power on to both the converter and broadcast set. Then set the dial of the broadcast set to 1500 kc. If an interfering broadcast signal is heard, there is no harm in shifting the dial slightly either way to tune it out. Now adjust L1 for maximum background noise or—better yet—find a short-wave station and adjust L1 for maximum volume. A good point to remember is that when returning to short-wave from the broadcast band be sure to reset the broadcast set to exactly where it was when the converter was aligned. This setting determines the sensitivity as well as the accuracy of the frequency calibration.

There is little likelihood of image interference, since the 1500-kc i.f. separates stations that might cause this trouble by a full 3 mc. Harmonics of the receiver oscillator may give spurious reception at some points.

### Materials for converter

**Resistors:** 1—270, 1—22,000 ohms, 1/2 watt; 1—2,200 ohms, 1 watt. If desired (see text), 1—697 ohms, 20 watts.  
**Capacitors:** (Mica) 1—50 µf; 2—.005 µf. (paper) 2—.01 µf; 1—3 µf (or three 1-µf units); (electrolytic) 2—40 µf, 150 volts; (variable) 2—140 µf air variables.  
**Miscellaneous:** 1—20-ma selenium rectifier; 1—12BE6 tube; 1—3-pole, 2-position switch.

### Coil Data

L1 100 turns on 1/2-inch diameter slug form, No. 34 wire  
L2 4 turns of hookup wire over L1  
L3 23 turns, tapped at 5 turns from bottom, wound on 3/4-inch form, 3/8-inch long, No. 22 wire  
L4 17 turns, 3/4-inch form, 3/8-inch long, No. 22 wire  
L5 4 turns of hookup wire over L4  
L1, L3, L4 close-wound with enamel-covered wire.

The actual frequency range of the converter is 5.5 megacycles to 16 megacycles. This covers all the important international short-wave broadcast bands as well as the 40- and 20-meter ham bands and a host of other commercial services.

END



"Have you got a five hour spool? I want my wife to hear what she sounds like!"



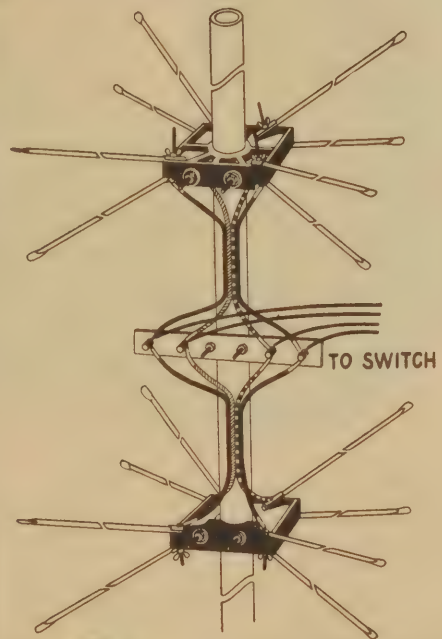
# World's most powerful TV ANTENNA!

## 22Db gain over tuned dipole!

- GUARANTEED 10 times more powerful than stacked 10 element Yagis.
- GUARANTEED to extend fringe area reception an additional 40 miles.
- Motorless All Direction reception — nine different antennas in one.
- Broad band **UHF — VHF** plus FM reception.
- Half the cost of single channel stacked Yagis — Patented to insure price protection, U. S. Pat. Nos. 2,585,670 — 2,609,503, others pending.
- Pre-assembled, quick-rig, flip-out.
- Nationally advertised.

The only TV antenna that instantly beams the television set directly to the signal without a rotor.

The biggest antenna news of the year. TV technicians are marveling at this amazing powerful high gain antenna. The only antenna that brings strong signals from all directions to weak signal areas instantly . . . with a flick of the nine position switch located near the TV set.

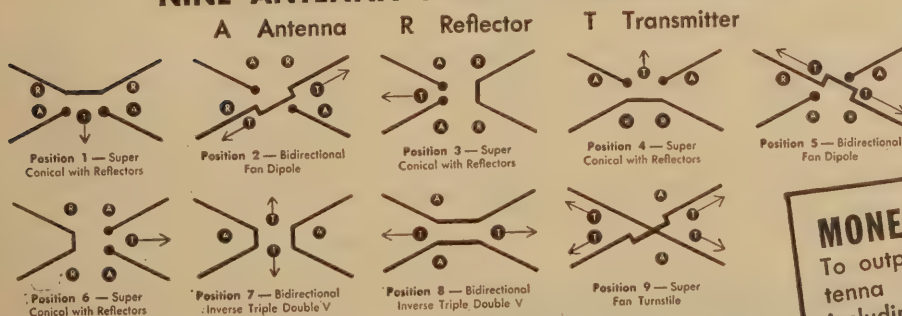


### \$36<sup>50</sup>

LIST PRICE

Includes Stacked Antenna Array. 9 Position Switch. Completely Wired Stacking Harness. A.I.M.—Automatic Impedance Matching Coupler.

### NINE ANTENNA SWITCH COMBINATIONS



Individually packaged with complete instructions.

**MONEY BACK GUARANTEE**  
To outperform any present day antenna array using a rotor motor, including stacked 10 element Yagis, 4 bay conicals, fans, double V's, etc.

Available at local jobbers or write for name of nearest representative.

# ALL CHANNEL ANTENNA CORP.

70-07 Queens Blvd., Woodside 77, N. Y.

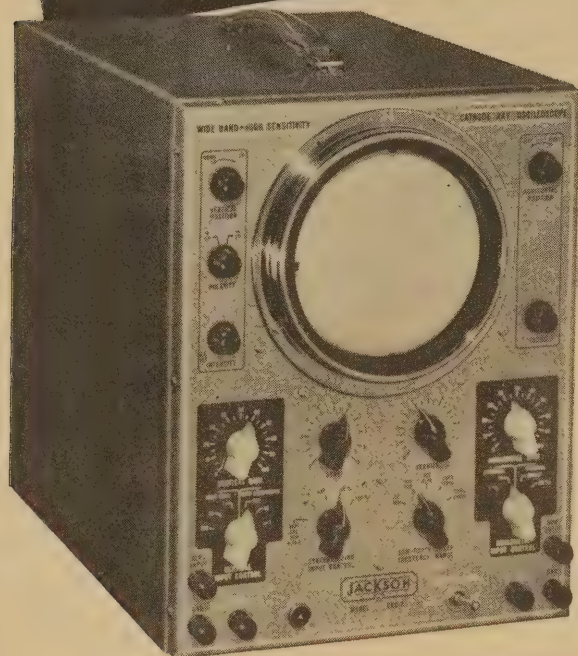
Hickory 6-2304



The world's most desirable oscilloscope for TV service.

**JACKSON**

MODEL CRO-2



Proved by the hundreds in use by TV manufacturers' and dealers' technicians

Judging by ratio of sales to market potential, this laboratory grade 5" oscilloscope is preferred by the great majority of television and electronic technicians. The specifications explain why such is the case.

## Specifications

**Vertical Amplifier**—Push-pull amplifiers provide flat response within 1.5 db from 20 cycles thru 4.5 Mc.

**Sensitivity Ranges**—The sensitivity ranges are .018, .18, 1.8, .25, 2.5, 25 RMS volts-per-inch.

**Horizontal Amplifier**—Push-pull with sensitivity of .55 RMS volts-per-inch.

**Input Impedances**—Vertical 1.5 megohms shunted by 20 mmfd. Direct to plates, balanced 6 megohms shunted by 11 mmfd. Horizontal: 1.1 megohms.

**Linear Sweep Oscillator**—Saw tooth wave 20 cycles to 50 Kc in 5 steps. 60 cycle sine wave also available as well as provision for using external sweep.

**Input Voltage Calibration**—Provides a standard voltage against which to measure voltages of signal applied to vertical input.

**Vertical Polarity Reversal**—For reversing polarity of voltage being checked or for choosing either positive or negative sync. voltages.

**Return Trace Blanking**—Electronic blanking provides clear, sharp trace to prevent confusion in waveform analysis.

**Synchronizing Input Control**—to choose among INTERNAL, EXTERNAL, 60 CYCLE, or 120 CYCLE positions.

**Intensity Modulation**—60 cycle internal or external thru front panel binding posts.

**Accessory**—Model CR-P Probe for demodulating RF and IF voltages.

**Prices:** Model CRO-2, Users' Net \$197.50  
Model CR-P Probe, Users' Net \$9.95

See your electronics distributor for more information, or write

**JACKSON ELECTRICAL INSTRUMENT CO. • DAYTON 2, OHIO**

"Service Engineered" Test Equipment  
IN CANADA: THE CANADIAN MARCONI CO.

## IMPROVING OSCILLATOR AND A.V.C. OPERATION

By JAMES SAREDA

WHILE experimenting with all types of receivers over a period of years, I have worked out several ways of improving the performance of the local oscillator and a.v.c. circuits in small superhets of the commercial and home-grown types.

Oscillator-pulling is one of the major problems in the design and construction of shortwave superhets. Any change in the tuning of the r.f. circuit affects the oscillator frequency whenever there is the slightest coupling between the two circuits. It is particularly bad with pentode mixers where the oscillator grid is coupled to the mixer grid through a small capacitor, but it is also noticeable in pentagrid mixers with separate oscillators when the oscillator grid and injector grid are tied together. Pulling can be reduced by taking the oscillator output from the plate, but this causes a serious reduction in the injection voltage fed to the mixer circuit from the oscillators.

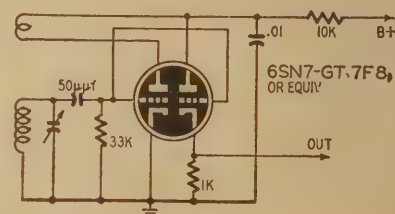


Fig. 1—Oscillator-buffer arrangement.

My solution to the problem of oscillator pulling is to use the oscillator circuit shown in Fig. 1 as a replacement for the existing oscillator circuit. I use a double triode with one section connected as the oscillator and the other as a buffer coupling the oscillator signal to the mixer. Since the tube is a dual triode, no extra holes, sockets, or mounting brackets are required. Simply wire in the circuit and connect the point which formerly went to the oscillator plate or grid to the cathode of the cathode follower.

The circuit shown uses tickler feedback but any other type of oscillator may be used. Simply tie the grids of the oscillator and cathode follower together. You can use any double triode as long as it has separate cathode connections. The 6SN7-GT is good for broadcast and slightly higher frequencies. A 7F8 is recommended for use above about 14 megacycles.

Another advantage of this circuit is that it makes approximately 90% of the oscillator voltage available at the mixer. Since the cathode follower has a low-impedance output, the lead between it and the mixer can be made long without the ill effects encountered when using plate-output circuits.

One trouble frequently encountered



# Make this resolution for 1953

## Read RADIO-ELECTRONICS every month!



This year promises to be the biggest yet for TV—and for the entire electronics field for that matter. New TV stations are mushrooming up all over the country—UHF is on the march, and one after another, new developments are rolling out of the electronic research labs and production plants of the nation—servicing and replacements will be at a new peak. How can you possibly keep up with this feverish progress? Very easy—just read RADIO-ELECTRONICS regularly. It gives you the latest and best articles on TV, radio and high-fidelity with emphasis on servicing, operation, construction and reports on the new and interesting.

*Subscribe Now*

### CHECK THESE FEATURES Scheduled for Future Publication

- A Successful TV Service Business
- High-Gain Stacked Rhombic TV Antenna
- TV Oddities
- Artificial Delay Lines
- Tubeless Amplification with diodes
- High Quality AM Tuner
- Adapting Relays
- Electropsychometer
- Hazards on the Bench

**SAVE UP TO 8¢ A COPY  
OVER THE NEWSSTAND RATE**

Three Years . . . . .	<b>\$8<sup>00</sup></b>
Two Years . . . . .	<b>\$6<sup>00</sup></b>
One Year . . . . .	<b>\$3<sup>50</sup></b>

25 West Broadway

New York, N. Y.



# three TIME-SAVING OHMITE *Little Devil*®

## RESISTOR ASSORTMENTS

FOR RADIO-TV SERVICEMEN



WITH HANDY

## PLASTIC CABINET

ALL FOR THE PRICE OF RESISTORS ALONE!

Here's a handy all-plastic resistor cabinet that's a real time-saver. Five drawers, each with eight individually-labeled compartments, make it easy to locate the right resistor and to maintain visual stock control.

The 1/2-watt assortment contains 150 carefully selected Ohmite "Little Devil," individually marked, insulated composition resistors. The 1 and 2-watt assortments each contain 125 resistors. The assortments include the 40 values (10 ohms to 10 megohms) most frequently used by servicemen.

This cabinet is offered at the price of the resistors alone. See your jobber.



**CABINETS CAN BE STACKED ON EACH OTHER**  
A dovetail joint is provided on top and bottom of each cabinet so they can be stacked one on top of another.

OHMITE MANUFACTURING CO., 4894 W. Flournoy Street, Chicago 44, Ill.

Be Right with **OHMITE**®

RHEOSTATS · RESISTORS · TAP SWITCHES



in superhet circuits is caused by high harmonic output from the local oscillator. Oscillator harmonics beat with harmonics of strong local signals to produce spurious beats in the i.f. range. These beats cause a series of whistles which can be distinguished from images by the fact that they tune in and out very sharply.

I find that the harmonic output of such oscillators can be markedly reduced by rewiring the circuit to use plate-circuit tuning instead of the usual tuned-grid circuit. The circuits in Fig. 2 show tuned-plate oscillators. The circuit at *a* is used with two-winding coils and the circuit at *b* uses tapped coils. The triode shown may be the oscillator section of a converter tube or a separate oscillator.

### A.v.c. circuits

The circuit in Fig. 3-a shows the detector-a.v.c. arrangement used in most simple superhets. This system is satisfactory in most respects but it pro-

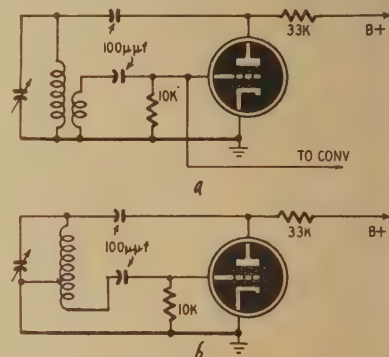


Fig. 2—Two methods of reducing oscillator harmonics by plate-circuit tuning.

duces a lot of distortion with high percentages of modulation on the signal. The villain is the 1-megohm a.v.c. filter resistor which shunts the 500,000-ohm diode load resistor. With the values shown, the presence of the a.v.c. circuit can produce distortion as high as 23% on a 100% modulated signal.

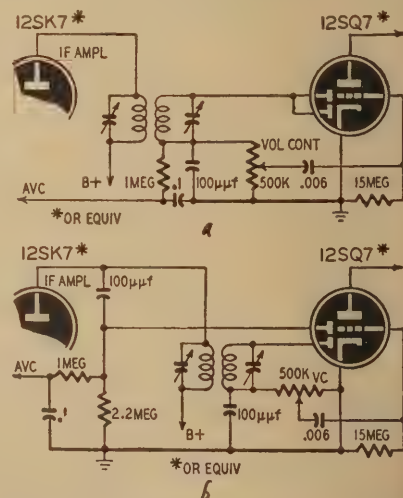


Fig. 3—(a) Standard a.v.c. circuit. (b) Modification for less distortion.

The remedy is to use one of the diodes of the usual duo-diode-triode used as a separate a.v.c. rectifier connected as shown in Fig. 3-b. The change is easy to make. The 100-μf capacitor and the



For **BETTER** PERFORMANCE  
For **LASTING** PERFORMANCE

ALWAYS INSTALL

**QUAM**

*Adjust-a-Cone*  
**SPEAKERS**



The **ONLY**  
**SPEAKER**  
with the  
**U-SHAPED**  
**COIL POT**  
and the  
**ADJUST-A-CONE** VOICE COIL

Write for Catalog  
**QUAM-NICHOLS CO.**

521 E. 33rd Place  
CHICAGO 16, ILLINOIS

Also Manufacturers of  
**QUAM Focalizer Units**  
**Ion Traps, and**  
**Tru-Match Transformers**

## EASY TO LEARN CODE

It is easy to learn or increase speed with an Instructograph Code Teacher. Affords the quickest and most practical method yet developed. For beginners or advanced students. Available tapes for beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready—no QRM.

**ENDORSED BY THOUSANDS!**

The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands of successful operators have "acquired the code" with the Instructograph System. Write today for convenient rental and purchase plans.



**INSTRUCTOGRAPH COMPANY**

4701 Sheridan Rd., Dept. RC, Chicago 40, Ill.

JANUARY, 1953

2.2-megohm resistor are the only components which must be added. In this circuit, the a.v.c. has little effect on the detector and distortion is reduced.

### Novel a.v.c. circuit

In almost all modern sets, a.v.c. voltage is applied to the control grids of remote-cutoff tubes in the r.f. or i.f. sections of the set. The circuit in Fig. 4 shows a system of applying the a.v.c. voltage to the screen grids of the controlled tubes. This circuit eliminates the elaborate a.v.c. network. Also, since the control-grid voltage does not change

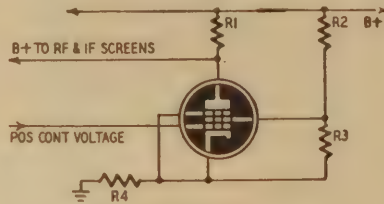


Fig. 4—Circuit for supplying a.v.c. voltage to r.f.- and i.f.-amplifier screen grids for improved control action.

nearly so much as it does when the a.v.c. voltage is applied to it, the amplifiers are being operated at all times over the most linear portions of the characteristic. This reduces distortion often caused by operating remote-cutoff tubes over the curved portions of the characteristic on strong signals. In the later i.f. stages where cross-modulation is not a problem, sharp-cutoff tubes can be used.

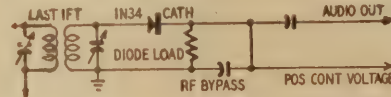


Fig. 5—Suggested detector circuit for developing positive control voltage.

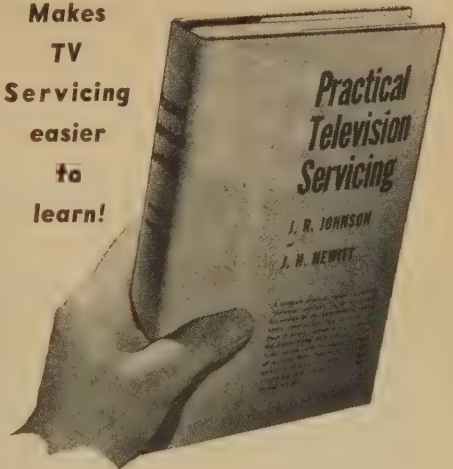
The control tube in Fig. 4 is a high-transconductance, sharp-cutoff pentode. R2, R3, and R4 make up a voltage divider which supplies proper operating voltages to the screen and cathode of the control tube. The resistors are proportioned so the screen operates with maximum permissible voltage and the cathode is 3-4 volts positive with respect to the grid. R1 is the dropping resistor supplying the screen grids of the r.f. and i.f. amplifiers controlled by a.v.c. It should be adjusted so the screen voltages are normal with no signal.

The grid of the control tube connects to a point which goes positive with increasing signal. The positive control voltage can be obtained by modifying the detector to conform with that in Fig. 5. However, if the set has a plate or infinite-impedance detector, take the control voltage from the detector cathode. In this case, bias the cathode of the control tube 3-4 volts higher than the no-signal cathode bias of the detector.

When a signal is received, the grid of the control tube goes increasingly positive and the drop across R1 increases. This lowers the screen voltage and reduces the gain of the r.f. and i.f. stages. Do not connect the circuit to the screen of a converter tube unless a separate oscillator tube is used because the changes in screen voltage cause frequency shift.

END

Makes  
TV  
Servicing  
easier  
to  
learn!



**BIGGEST \$4 WORTH  
IN TV TRAINING  
HISTORY!**

**PRACTICAL TELEVISION SERVICING**  
by J. R. Johnson and J. H. Newitt  
334 pages, 253 helpful illustrations

Here, for only a small fraction of the price you might expect to pay is concise, clearly understandable television training of the most practical sort! It is the ideal book for those who already know something about basic radio service and now want to forge ahead in the better-paid, television field.

First you learn where and how TV differs from radio. You learn what equipment is needed and where and how to use it properly on all kinds of TV jobs. Every phase of troubleshooting is explained from a practical, on-the-job standpoint—NOT by a lot of confusing mathematics and meaningless theory. For instance, many pages of PRACTICAL TELEVISION SERVICING are devoted to locating common troubles just by visual observation.

### DATA BASED ON ACTUAL SERVICE SHOP EXPERIENCE

Dozens of actual service case histories help make puzzling jobs easier to handle. Over 250 illustrations and pattern photos explain details step by step. Other subjects include component replacement data, wiring details, hints on testing and information on subjects from fringe area reception to improving picture linearity in difficult locations.

The book that  
helps radio men

**CASH IN  
ON TV  
SERVICE  
PROFITS!**

Covers every phase  
of television.

**CONSTRUCTION  
OPERATION**

**VISUAL  
TROUBLE-  
SHOOTING**

**INSTRUMENT  
TROUBLE-  
SHOOTING**

**SERVICING  
COMPONENTS**

**COMPONENT  
REPLACEMENT**

**PATTERN  
ANALYSIS**

**SHOP HINTS, etc.**

... in a way you  
can easily under-  
stand.

A great book to  
help you pass TV  
service license ex-  
aminations!



**READ IT 10 DAYS . . . AT OUR RISK**

**Dept. RE-13, RINEHART BOOKS, INC.,  
Technical Division  
232 Madison Ave., New York 16, N. Y.**

Send PRACTICAL TELEVISION SERVICING for 10-DAY EXAMINATION. If I decide to keep the book, I will then remit \$4.00 plus a few cents postage. Otherwise, I will return book postpaid and owe you nothing.

Name .....

Address .....

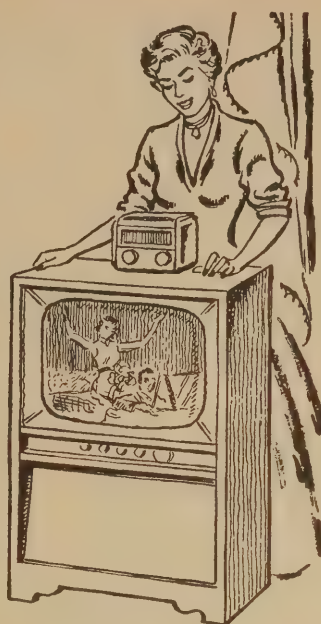
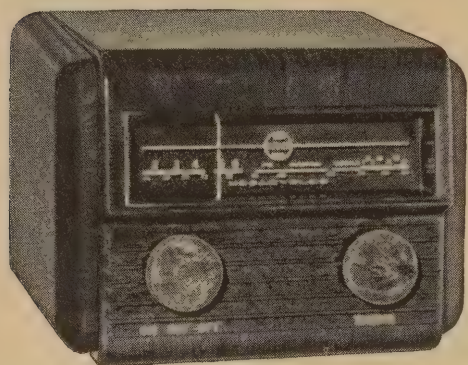
City, Zone, State .....

Employer's Name & Address .....

OUTSIDE U.S.A.—Price \$4.50 cash only. Money back if book is returned in 10 days.



# Brighter, Sharper, TV Reception



## with the **TURNER** Model TV-2 Booster

You get clearer, sharper pictures with a minimum of annoying interference and snow even in weak signal areas with the TURNER TV-2 Booster. It's designed with an eye to beauty as well as outstanding performance. The rich, mahogany plastic cabinet is a handsome addition to any room... the high quality cascode circuit reduces noise and snow, producing an excellent picture even in extreme fringe areas.

The TURNER Booster is simple in operation. A single tuning knob permits fine adjustment for best reception of picture and audio over all 12 TV channels. The unit is quickly and easily installed on any television set. Get the best possible TV reception... get the TURNER Model TV-2 Booster!

The **TURNER** Company 933 17th St. N.E. Cedar Rapids, Iowa  
IN CANADA:

Canadian Marconi Company, Toronto, Ont., and Branches.

EXPORT:

Ad. Auriema, Inc., 89 Broad Street, New York 4, N. Y.



- 1220 pages
- 80,000 items
- 8,000 illustrations
- 8" x 11"—5 lbs.

Publisher's price  
\$6.50—your price  
through your  
regular parts  
distributor **\$1.95**

The right part when you need it, for service

This permanent, hard cover Official Buying Guide of the electronic-TV parts and equipment industry with its comprehensive detailed index, eliminates the need for maintaining files of small catalogs and manufacturers' literature. RADIO'S MASTER catalogs 90% of TV and electronic equipment. Not merely part number listings—complete descriptions, specifications and illustrations written and compiled by each manufacturer. Enables you to make comparisons or substitutions right now!



UNITED CATALOG PUBLISHERS, INC.  
110 Lafayette St., New York 13

## Construction

### LINEAR SWEEP GENERATOR

A bootstrap type sawtooth generator produces an output waveform which is more linear and has a wider voltage range than any other type of sawtooth generator. Its principal disadvantage is the relatively long time which must elapse between sweep cycles. The basic bootstrap generator is shown in Fig. 1.

V1 is the control tube which must be triggered by a negative pulse each time a sweep stroke is desired. This tube is normally conducting heavily, drawing its current through diode V3 and resistor R1. Because of the large voltage drop across R1, C2 charges to a voltage approximately equal to  $E_1$ . C1 is substantially discharged while V1 is conducting.

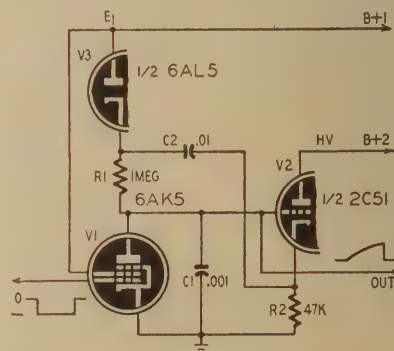


Fig. 1—The basic bootstrap generator.

A negative trigger pulse on the grid of V1 cuts it off and C1 begins to charge through V3. If the cathode of V3 remained at a fixed voltage level, the charge on C1 would increase exponentially to produce a nonlinear sawtooth. In this circuit, the grid of V2 becomes more positive and the voltage drop across R2 increases in proportion to the charge on C1. The rising voltage across R2 is applied to the cathode of V3 so the voltage drop across R1 and the charging current of C1 are substantially constant so the output voltage is a linear sawtooth.

At the end of the sweep stroke, the trigger voltage drops to zero. V1 conducts and C1 discharges rapidly through it. C2 recharges through the resistance

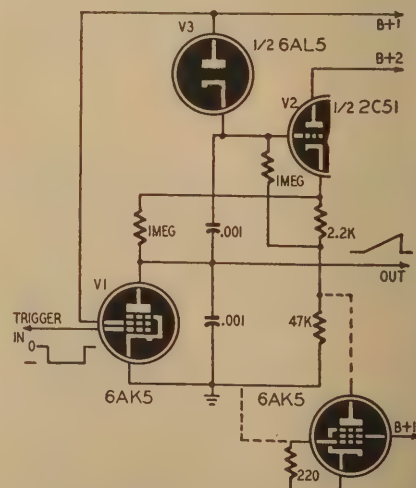


Fig. 2—Modification for higher rates.



of V3 in series with R2. Since C2 is usually about 10 times as large as C1, its recharging time will be considerably longer than the discharge time of C1. A new sweep stroke cannot be initiated until C2 has recharged to its original state. It is this recharging time that limits the repetitive rate of the trigger.

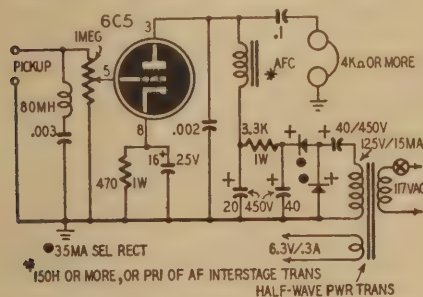
The circuit in Fig. 2 is a modified version of the bootstrap generator designed to provide a much higher repetition rate than the circuit in Fig. 1. The circuit is described in patent No. 2,606,287 issued to David O. McCoy. In this circuit, the grid of the cathode follower V2 connects directly to the cathode of V3 and to the plate of V1 through a .001- $\mu$ f capacitor. Another .001- $\mu$ f capacitor is connected between the plate of V1 and ground.

Now, during the recovery or flyback period, the lower capacitor discharges rapidly through the resistance of V1 while the upper capacitor recharges through V3 and V1 in series. Since the two capacitor values are equal and the resistances in series with them are approximately equal, the recovery time of this circuit is nearly equal to the flyback time so the trigger repetition rate is increased.

Linearity can be improved by replacing the 47,000-ohm resistor with a constant-current pentode connected as shown by dashed lines.

### INDIVIDUAL PHONOGRAPH

Habitual playing of code or language-training records on the home phonograph is one sure way of making the family unhappy, particularly if the phonograph is a part of the family radio or TV combination. You will probably want to listen to your records when others in the family would rather listen to a soap opera or watch TV.



#### Materials for amplifier

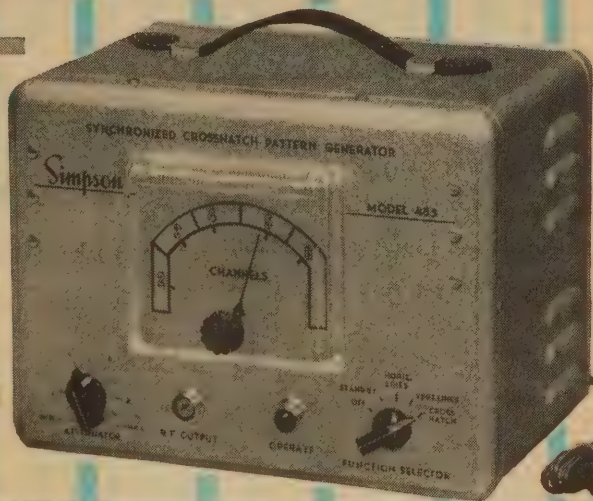
**Miscellaneous:** 1—470, 1—3,300 ohm, 1-watt resistors; 1—1-megohm volume control with switch; 1—a.f. choke, 150 henries or more (Thordarson T20C50, Stancor C-2300, or equivalent); 1—16- $\mu$ f, 25-volt, 1—20-, 2—40- $\mu$ f, 450-volt electrolytic capacitors; 1—.01, 1—.003, 1—.002- $\mu$ f, 400-volt paper capacitors; 1—r.f. choke, 80 mh; 1—half-wave power transformer, 125 volts, 15 ma, and 6.3 volts, 0.6-amp secondaries (Stancor PS-8415 or equivalent); 1—6C5 tube. Socket, chassis, input and output connectors.

You can keep the family happy by constructing the one-tube phono amplifier shown in the diagram and allowing the others the exclusive use of the radio combination.

The amplification of the single 6C5 is sufficient to provide good headphone volume when used with a crystal pickup. The L-C network across the input terminals reduces scratch and needle hiss.—A. Iwanivsky

END

## single test—double check



new

Simpson

MODEL 485

## synchronized crosshatch pattern generator

You control your own broadcast test pattern for initial installations and linearity adjustment calls with the Simpson Model 485. Newly developed Model 485 provides a synchronized signal, modulated on the carrier frequencies of channels 2 through 6, which can be tuned and sent through the receiver under test—anywhere, at any time! The vertical and horizontal sync pulses provide means by which the pattern is locked in on the TV receiver. Since this is a transmitted TV signal, it is not necessary to check against a broadcast pattern. Linearity is double checked with a single test—no call back to cut service profits.

Dealer's net price, including special output cable for 75 and 300 ohm terminations, only \$147.50. Ask your jobber for full information or write—

### SIMPSON ELECTRIC COMPANY

5200 West Kinzie Street, Chicago 44, Illinois  
CO 1-1221

BURTON BRONIE ADVERTISING

Another reason why Simpson is world's largest manufacturer of test equipment

## OPPORTUNITY AD-LETS

Rates—45¢ per word (including name, address and initials). Minimum ad 10 words. Cash must accompany all ads except those placed by accredited agencies. Discount, 10%, for 12 issues. Misleading or objectionable ads not accepted. Copy for March issue must reach us before January 21, 1953.

Radio-Electronics, 25 W. Broadway, New York 7, N. Y.

TUBES AND EQUIPMENT BOUGHT, SOLD AND EXCHANGED. For a fair deal send details to B. N. Genster, W2LN1, 136 Liberty, N. Y. 6, N. Y.

15 TESTED ONE-TUBE CIRCUITS 25¢, INCLUDING "Radiobuilder," catalog. Laboratories, 1131-B Valota, Redwood City, California.

WANTED—TOP PRICES PAID—Navy Selsyns 1DG, IF, 1CT, 5CT, 5D, 5DG, 5G, 6G, 7G, etc. and BC-348, BC-221, AN/ARC-1 AN/ART-3, AN/ARC-3, RTA-1B, AN/APR-4. Electronic Research, 712 Arch St., Philadelphia, Pa.

BUY WHOLESALE—25,000 ITEMS—CATALOG 25¢. Matthews, 1472-P4 Broadway, N. Y. C. 36.

FCC LICENSE COACHING \$1 PER LETTER. "Electronic Calculators," "Electronic Mathematics," "Practical Audio Engineering," data sheets 10¢ each or 3 for 25¢. W. R. Moody, Technical Consultant, 5705 Carters Lane, Riverdale, Maryland.

ALL TYPES OF ANTENNAS FOR AMATEUR AND TV. Aluminum Tubing. Willard Radcliff, Fostoria, Ohio. TV-FM ANTENNAS. ALL TYPES INCLUDING UHF. Mounts, accessories. Lowest prices. Wholesale Supply Co., Lunenburg 2, Mass.

WANTED: ALL TYPES OF RECEIVING AND TRANSMITTING TUBES. Surplus receivers and transmitters. Williams Electronics Co., 168 Washington St., N. Y. C.





(Groups-of-three most frequently used Stancor TV Replacement Components listed below)



**Don't Waste valuable time waiting for a replacement—carry it in stock!**

STANCOR CHOKES	C-2325 C-2326 C-2327	<b>COVER 70%</b> of your TV REPLACEMENTS*
STANCOR DEFLECTION YOKES	DY-1 DY-8 DY-9	<b>COVER 70%</b> of your TV REPLACEMENTS*
HORIZONTAL DEFLECTION OUTPUTS	A-8127 A-8128 A-8130	<b>COVER 45%</b> of your TV REPLACEMENTS*
VERTICAL DEFLECTION OUTPUTS	A-8112 A-8115 A-8123	<b>COVER 70%</b> of your TV REPLACEMENTS*
VERTICAL BLOCKING OSCILLATORS	A-8111 A-8121 A-8122	<b>COVER 65%</b> of your TV REPLACEMENTS*

\* Based on a statistical analysis of all replacement recommendations in the Stancor TV Replacement Guide.

Stancor Transformers are listed in HOWARD W. SAMS' Photofact Folders and JOHN RIDER'S Tek-Files.

**FREE!**

Stancor's new 24-page catalog listing over 475 transformers and related components for all types of electronic applications. Includes over 100 TV units. Get your free copy from your Stancor distributor or write Stancor direct!



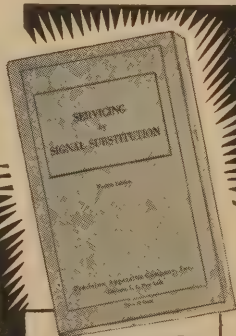
**STANDARD TRANSFORMER CORPORATION**

3592 ELSTON AVENUE, CHICAGO 18, ILLINOIS

**OVER 50,000  
TECHNICIANS  
HAVE LEARNED**

**HOW TO GET  
THE MOST OUT  
OF BASIC TEST  
EQUIPMENT**

for A.M. - F.M. - TV



**ONLY 40¢**

103 pages. Invaluable information that will help you re-double the value of your basic test equipment.

**'SERVICING BY  
SIGNAL SUBSTITUTION'**  
A BEST SELLER FOR OVER 12 YEARS!  
(NEW, UP-TO-DATE, 12th EDITION)

The Modern, Simplified, Dynamic Approach to Receiver Adjustment & Alignment Problems.

- ★ Nothing complicated to learn
- ★ No extra equipment to purchase
- ★ Universal...non-obsolete
- ★ Employs only Basic Test Instruments

Ask for "S.S.S." at your local Radio Parts Jobber or remit 40¢ in small stamps or coin directly to factory.

**PRECISION APPARATUS COMPANY, INC.**  
92-27 HORACE HARDING BLVD., ELMHURST 4, N. Y.

## B. C. ABANDONS BULLETIN

The *Bulletin*, long the official organ of the service technicians of Vancouver, and more recently, of the British Columbia Council of the Radio Electronic Technicians Association, has been discontinued. Abandonment of the paper was decided upon at the provincial council meeting at Nanaimo last September. The reason was the lack of an editor with journalistic training.

It was not learned whether the Vancouver association intends to continue carrying on a local paper of its own.

## NEW PHILADELPHIA GROUP

A new organization to be known as the Television Servicing Dealers Association has been formed in Philadelphia. President of the new group is Dave Krantz, chairman of the Federation of Radio Servicemen's Associations of Pennsylvania, and its secretary is Edward J. Strychowski. Louis J. Smith is vice-president, and Sam Brown treasurer.

Reasons for a new organization in Philadelphia, which already has the Philadelphia Radio Service Men's Association (PRSMA) and the Television Contractors Association (TCA), were not given.

## FRSAP TO HEAR EDITOR

The Pennsylvania Federation of Radio Servicemen's Associations (FRSAP) has tentatively arranged a series of lectures at Pittsburgh, York, Williamsport, Harrisburg, Wilkes Barre, Scranton, Reading, and Altoona. The proposed schedule at time of writing was:

January 6	Pittsburgh
January 7	York
January 8	Williamsport
January 19	Harrisburg
January 20	Wilkes Barre
January 21	Scranton

Schedules for Reading and Altoona were not fixed when this issue was made up.

The lectures are to be delivered by Mort Bernstein, Associate Editor of RADIO-ELECTRONICS, a radio engineer and professional television instructor as well as a radio-television editor.

## CHICAGO MOVES TO LICENSE

The Chicago City Council has requested the Illinois State Legislature to amend the Cities and Villages Act to permit the city of Chicago to license radio and television service technicians. The request, made at the end of October, cannot be acted upon until the Legislature meets this month (January), and could not be enacted into law until July 1.

If approved, the city will then hold the necessary hearings to determine what type of licensing, if any, is desirable, and how a license law should be enacted and enforced.

Sponsors of municipal licensing in Chicago include Frank Moch, president of the Television Installation Service Association, and E. T. Wood, business manager of Local 1639, International Brotherhood of Electrical Workers, a

RADIO-ELECTRONICS



local of 700 television repairmen. Opposing it was Norman Brahmstedt, of the National Appliance and Radio-TV Dealers Association, who reported that his association would make a formal statement of its views at a later date, probably before the State Legislature.

### BBB KNOCKS \$1 CALLS

The Better Business Bureau of New York City—in a special bulletin issued late last October—urged that advertising of specific prices for TV service be discontinued. The bulletin stated that the Bureau has been increasingly concerned with “apparently flat-rate low-price offers, such as ‘\$1 per call plus parts’” and that complaints about such service are increasing.

The Bureau recommended that in advertisements of television service:

1. No prices should be mentioned.
2. “Free estimate” offers should not be used.
3. “Guarantees” should be specific as to duration and actual terms.

### FRSAP TO PRESENT PLAQUE

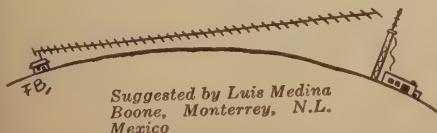
The Pennsylvania Federation will present its plaque—awarded annually to the person or organization who has done most for the benefit of radio service technicians during the year—at Harrisburg on January 18.

Last year's plaque was awarded to John Rider, long-time champion of the service technician and publisher of servicing aids.

### TV GYP CHARGE HOLDS TWO

Charges of larceny have been preferred against two television service technicians whose firm levied a charge of \$34.13 for “repairing” a set whose only fault was a bad tube. The men were employed by Sibko Television Service Corporations, of Queens, one of the boroughs of New York City. It is said to be one of the largest “\$1.00 plus parts” concerns in that area.

The set was a “planted” one, with all parts marked invisibly, and one dead tube. The receiver was removed to the shop because “the high-voltage circuit was out” and allegedly returned later with a bill for \$34.13, which itemized a new flyback transformer, a capacitor, and two resistors. All the supposedly replaced parts still had their original code markings, however. A warrant was issued for the man who removed the set from the house and for the bench man who gave the estimate for replacing the non-replaced parts. END



“The Best Yagi”

## TRAIN *At Home* FOR OPPORTUNITIES IN UHF-TV SERVICING

### Set Your Own Pace with This Practical Program!

Get in on the ground floor of this fast-growing field. Train now to cash in on the opportunities that are yours in UHF-TV SERVICING with proven, practical T.C.I. training. Here is non-mathematical training that's complete . . . down-to-cases . . . up-to-the-minute. Here is training you take in your spare time, without leaving your present job! Think of it—in your own home you learn TV set conversion, master antenna installation, the latest in UHF-TV, money-making short cuts and much more. You learn to troubleshoot, test and repair TV sets the only practical way—by actually doing this work yourself!

#### Here's How You Learn By Doing!

You get the experience you need by working on a large screen, modern TV receiver that's given to you with the course and is yours to keep. As an optional feature you get two weeks of field experience on service calls and on the repair bench with one of Chicago's largest independent TV servicing organizations. You profit from the experience and know-how of men in the field. Not through books alone but by actually doing the work yourself, you get the knowledge you need to qualify for opportunities in UHF-TV SERVICING! **Age is no barrier.** Many T.C.I. students are over 40! Mail Coupon for full facts, FREE Catalog and SAMPLE LESSON. Act NOW!



**VETERANS**  
discharged since June 27, 1950 are eligible for G. I. benefits. Check coupon.

## TELEVISION COMMUNICATIONS INSTITUTE

205 WEST WACKER DR., DEPT. RE-13, CHICAGO 6, ILL.

**MAIL NOW  
FOR FREE  
BOOKLET**

#### TELEVISION COMMUNICATIONS INSTITUTE

205 W. Wacker Dr., Dept. RE-13, Chicago 6, Ill.

YES! Rush full facts on UHF-TV training. Include FREE Catalog and Sample Lesson. I am not obligated. Salesman will not call.

Name..... ☐ **Veterans** Check here

Address.....

City..... Zone..... State.....

☐ **BEGINNERS:** Check here for information on Pre-TV Radio Course.

#### LEARN WITH "AMECO" COURSES

**BECOME A RADIO AMATEUR**  
Simple, Low Cost, Home-Study Courses prepare you to pass F.C.C. Code and Theory license examinations.

FREE →

Write for details and receive free sample F.C.C.-type questions and answers for all amateur examinations.

**AMERICAN ELECTRONICS CO.**  
1451 Wilkins Ave. (Dept. RE1), New York 59, N. Y.

#### PEN-OSCIL-LITE

Extremely convenient test oscillator for all radio servicing; alignment • Small as a pen • Self powered • Range from 700 cycles audio to over 600 megacycles u.h.f. • Output from zero to 125 v. • Low in cost • Used by Signal Corps

• Write for information.  
**GENERAL TEST EQUIPMENT**  
38 Argyle Ave. Buffalo 9, N. Y.

#### OPEN WIRE LINE

**\$395** POSTPAID in U.S.A.  
Per 100 Feet

100, 150, 200, 250 Ft. REELS

- Extremely Low Loss
- Polystyrene Spacers 6" Apart
- No. 18 Copperweld Wire
- Ideal for Fringe Areas
- Very Finest Quality
- Immediate Delivery Via P.P.

**R. J. BUCHAN CO.**

Box 9

BRICELYN, MINN.





**for PA  
LIKE ON TV**

**636  
Slimair  
DYNAMIC  
MICROPHONE**

Gives you features similar to those in the famous E-V Slim-Trim TV Microphones. That's why it is so outstanding for Public Address, Recording and other general-purpose use.

List Price ..... \$70

**SMOOTH RESPONSE  
60-13,000 CPS  
HIGH OUTPUT  
OMNIDIRECTIONAL  
ACOUSTALLOY  
DIAPHRAGM  
BUILT-IN  
BLAST FILTER**

Can be used in the hand, on a stand, or overhead

SEND FOR BULLETIN

**Electro-Voice**

421 CARROLL ST. • BUCHANAN, MICH.  
Export: 13 E. 40th St., N. Y. 16, U.S.A.



A can opener gave us this excellent interior view of the 67½-volt "B" battery. The plastic cup, felt pad, and metal end cap are all visible.

## New Long-Life Cell Boon to Portables

The newly developed 1½-volt *alkaline type* dry cell is now being used in new long-life A and B batteries for personal portable receivers. The new 67½-volt B battery is 22% smaller than ordinary 67½-volt dry batteries yet increases playing time up to 100% in personal type portables. The companion 1½-volt A battery (size G) is 75% longer than conventional size D batteries but it provides up to five times the playing life.

Two of these new-type 1½-volt alkaline dry cells connected in parallel balances the life of one 67½-volt type and enables a personal portable to play up to ten times longer without battery change. One alkaline type 67½-volt battery and two alkaline type 1½-volt batteries in parallel have the equivalent playing life of two standard 67½-volt batteries and 10 to 12 1½-volt A batteries.

The crown type alkaline cell used



How the new battery compares in size with the popular RCA VS 016 model.

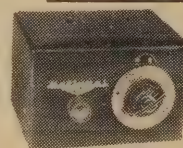
## DEPEND ON CONCORD FOR OUTSTANDING VALUES!

STANDARD BRANDS  
NEW GUARANTEED

### TUBES 60% OFF LIST!

Type	List	Your Cost	Type	List	Your Cost
1B3	\$2.55	\$1.02	6AL5	\$1.80	\$.72
1R5	2.10	.80	6AU6	1.80	.72
1T4	2.10	.84	6BG6G	4.80	1.92
1U4	2.10	.84	6AQ5	2.00	.80
3V4	2.00	.80	6SN7GT	2.20	.88
5U4GT	1.50	.60	6V6GT	2.00	.80
5Y3GT	1.10	.44	12AU7	2.40	.96
6AG5	2.25	.90	12AT7	2.90	1.16

60% OFF ON ALL  
OTHER RECEIVING TUBES



### NATIONAL TURRET BOOSTER

Finest turret tuner ever designed. Built-in Power supply. Brand New!

Lots of 6..... 10.00  
Lots of 3..... \$8.95 ea.  
Singly ..\$11.95

### VM 2 SPEED RECORD CHANGER

With automatic changer and shut-off. 33 1/3 and 78 RPM. Positive intermix of 10", 12" records. Jam proof!



18.95

### 10 ELEMENT CONICALS

Lots of 6—each 3.15  
Single lots—\$3.95 each  
Superb low-priced "all aluminum signal getter". Good channel reception. No special adjustments.

### "V" ANTENNAS

Single V—\$3.65 ea.  
Lots of 6—\$3.15 ea.  
Double V—\$8.95 ea.  
Lots of 3—\$8.65 ea.

Factory assembled for to electrical and mechanical performance.

### INTERLOCK TV LINE CORD

6 ft. line cord—for all popular TV sets. 27¢

### 3/2" STANDOFF

Fully adjustable, easy to mount. 50 for \$3.95

### LIGHTNING ARRESTOR

63¢

For twin lead or open transmission line. Mounts flat or on mast. \$1.25 List.

### 3/2" SCREW EYE

Insulated standoff. High quality, low price. 100 for \$2.75

### MAGNIFICENT BRITISH HI FIDELITY 5" PM SPEAKERS

A sensational value! 50-12,000 CPS Range. Outperforms most 8" and 10" units. Highly efficient for general use in amplifiers, radios, TV sets and custom combinations. 4.6 ohms impedance.

—1.5 oz. Alnico magnet. Buy now—while we still have stock on hand! Stock No. 99-A-850P. Singly, \$1.69 1.59 ea.  
In lots of 4.....

1/2 MEG. VOLUME CONTROL with SWITCH. Singly 30¢  
Lots of 6..... 29¢ ea.  
300 OHM TWIN LEAD—100 ft.—\$1.39, 1,000 ft.—\$10.95

All C.O.D.s 25% deposit—Minimum orders—\$5.00

### CONCORD RADIO

54-L Vesey Street, New York 7, N. Y.

Phone: DIgby 9-1132

OPEN WEDNESDAYS UNTIL 9 O'CLOCK

### CONCORD RADIO.

54-L Vesey Street, N. Y. 7, Dept. C-1

Please include my name on your special bargain mailing list. Free of charge.

Name.....

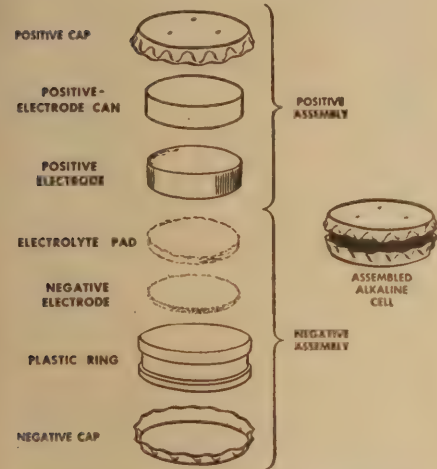
Address.....

City..... State.....



in these new batteries measures only 0.9 inch in diameter and 0.23 inch high. The positive electrode can, the positive and negative electrodes, and the electrolyte pad are sandwiched together inside a protective plastic ring between two "bottle caps" which serve as positive and negative terminals.

Exploded View Of Alkaline Cell  
Used In RCA VS 216



Schematic view of the new B-battery.

The cells, which use zinc for the negative pole and manganese dioxide for the positive pole, and an alkaline electrolyte, are stacked together in paper tubes. The number of cells which go into a



Battery complement of a new portable. Playing time is enormously increased.

battery depends on its voltage and current ratings. The completed battery is enclosed in a steel shell which resists swelling and prevents it from wedging in the radio. END

### ELECTRONIC POSTMAN?

Electronic mail-sorting devices and supervisory TV systems are to be installed in Canadian Post Offices. The average human handler can reach only about 60 pigeonholes in sorting mail. Pushbutton electronic selectors will enable each man to reach 300 slots and eliminate multiple handling. Closed circuit TV installations will permit postal inspectors to watch operations anywhere from a central point, instead of from the peephole galleries now used.

JANUARY, 1953

# Multiplies the SIGNAL

## WHERE IT COUNTS THE MOST

MODEL 3012-A

## IMPROVED Tenna-Top TV BOOSTER

LOW COST

Mounts at Antenna  
Ahead of Lead-in

**FOR ALL-BAND  
OR SEPARATE  
HIGH AND LOW  
BAND ANTENNAS**

**BOOSTS SIGNAL  
—NOT LOCAL  
LEAD-IN NOISE**

**PERMITS LEADS  
UP TO 3000 FT.**

**AUTOMATIC  
SELF-TUNING**

**New MULTI-POWER low-noise circuit now provides extra gain in the E-V 3012-A Tenna-Top on all 12 VHF channels. Has 3 broadband balanced stages—one for the high bands, one for the low, and one that multiplies the power of each for added output. Mounts at antenna ahead of the lead-in—amplifies only the wanted TV signals, not any local noise interference. Gives higher signal-to-overall-noise ratio. Gets clearer pictures in tough fringe or noisy locations.**

**Turns "on" or "off" with the TV receiver switch. Tunes itself automatically—no manual tuning. Junction control box placed at TV set has Hi-Lo gain switch. Built-in tapped transformer permits use of best quality lead-in up to 3000 feet. Single twin-lead line carries power up and signal down. 300 ohm input and output. Easy to install.**

**Model 3012-A Tenna-Top. List Price . . . . \$59.50**

**Tens of Thousands of E-V Tenna-Tops Now in Use**

See Your E-V Distributor  
or Write for Bulletin

# Electro-Voice INC.

421 CARROLL STREET • BUCHANAN, MICHIGAN  
Export: 13 East 40th St., N.Y. 16, U.S.A., Cables: Arlab



# KNOWS HIS BUSINESS



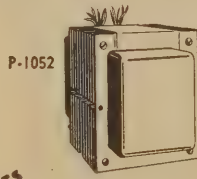
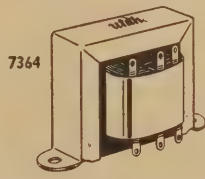
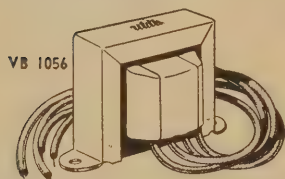
Yes, this Service Man knows his business—knows that he must be sure replacement transformers will perform superbly and reflect favorably his reputation as a highly skilled service technician.



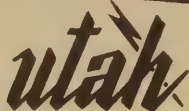
He doesn't gamble with mediocre transformers, he installs the choice of leading set manufacturers—Utah. Don't hazard your reputation with unproven parts, specify "Utah" Transformers and be sure of a job well done.

POWER TRANSFORMERS • VERTICAL OUTPUT TRANSFORMERS • FILTER CHOKES  
VERTICAL BLOCKING OSCILLATORS • AUDIO OUTPUTS

**Free** WRITE TODAY FOR Complete TRANSFORMER INFORMATION, UTAH TRANSFORMER DIVISION, CATALOG T-100



Speakers . . . Transformers



Export Dept. Rocke International Corporation, N. Y. C.

**RADIO PRODUCTS CO., INC.**  
HUNTINGTON, INDIANA

A WHOLLY OWNED SUBSIDIARY OF NEWPORT STEEL CORPORATION

## 3 easy STEPS TO BETTER TV INSTALLATIONS

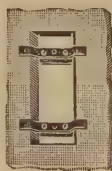
with **MOSLEY FLUSH SOCKETS**



1. Get the—PK Package—contains everything needed to complete installation!

2. No outlet box needed. Mounting brackets fit any type wall—easily, quickly installed!

3. Here's a neat, efficient installation. TV owners like the convenience of plug-in connection to lead-in!



Available at Radio Parts Jobbers

**MOSLEY Electronics**

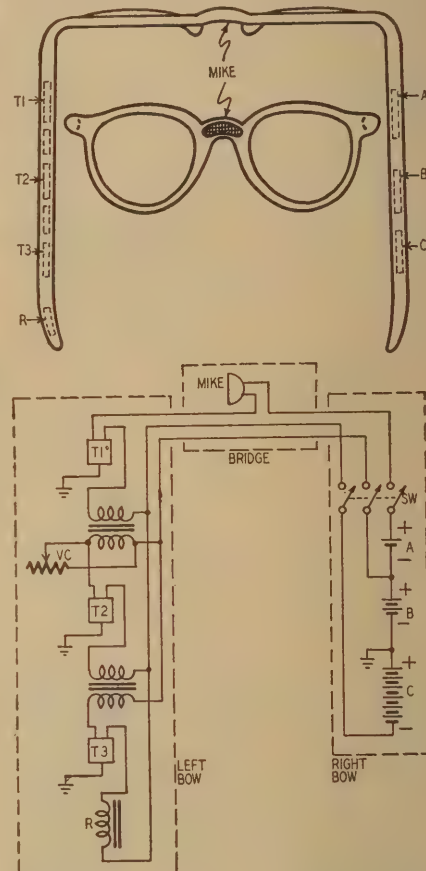
2125 Lackland Rd.  
Overland, Missouri

## SPECTACLE-TYPE HEARING AID

Patent No. 2,613,282

Alan M. Scaife, Pittsburgh, Pa.

Some hard-of-hearing persons object to wearing a hearing aid because it is conspicuous. This invention hides the hearing aid within a pair of spectacles. All components are located within the frames or the bridge. No external wiring is needed. The microphone is located in the bridge, so that maximum sound is picked up when the person turns his head toward the speaker. The device and its circuit are shown below.



Assembly and circuit of hearing aid.

The amplifier is built into the left-hand bow of the spectacles as shown. It uses 3 transistors, transformer coupled. Reproducer R may be of the bone conduction type. It presses against the bone just back of the ear. A tiny volume control is also included in this frame, together with a ring type switch which is operated by the fingers. The right-hand frame carries three batteries. A supplies 1.5 volts to energize the carbon microphone M. It also biases the emitter of the first transistor, T1. The battery B provides a voltage of 3 volts to bias the emitters of the other transistors, T2, T3. C is a 30-volt battery for the collectors.

## TV MARKER GENERATOR

Patent No. 2,610,228

George F. Devine, Marcellus, N. Y.  
(assigned to General Electric Co.)

This invention reduces the number of crystals needed for correct TV alignment. It uses one crystal to mark the desired picture carrier (i.f. or r.f.). A second crystal provides markers at 1.5-mc intervals on either side of the pix carrier. Thus it automatically indicates the adjacent sound carrier and the accompanying sound carrier. Also, the third harmonic of the 1.5-mc crystal may be used to align intercarrier sound stages.

A sweep generator is connected as usual to the TV under test and to the sync terminal of an oscilloscope. The 1.5-mc oscillator provides a fundamental and harmonic frequencies which mix with the desired picture carrier signal. The latter may be i.f. or any r.f. channel. Due to modulation, the detector output contains a large



## New Patents

pip which indicates the picture carrier and smaller pips at intervals of 1.5 mc.

These pips identify picture and sound carriers for correct alignment. The third harmonic of the 1.5-mc crystal is used to align intercarrier sound.

### VOLTAGE LEVEL SELECTOR

Patent No. 2,612,550

George T. Jacobi, Schenectady, N. Y.  
(assigned to General Electric Co.)

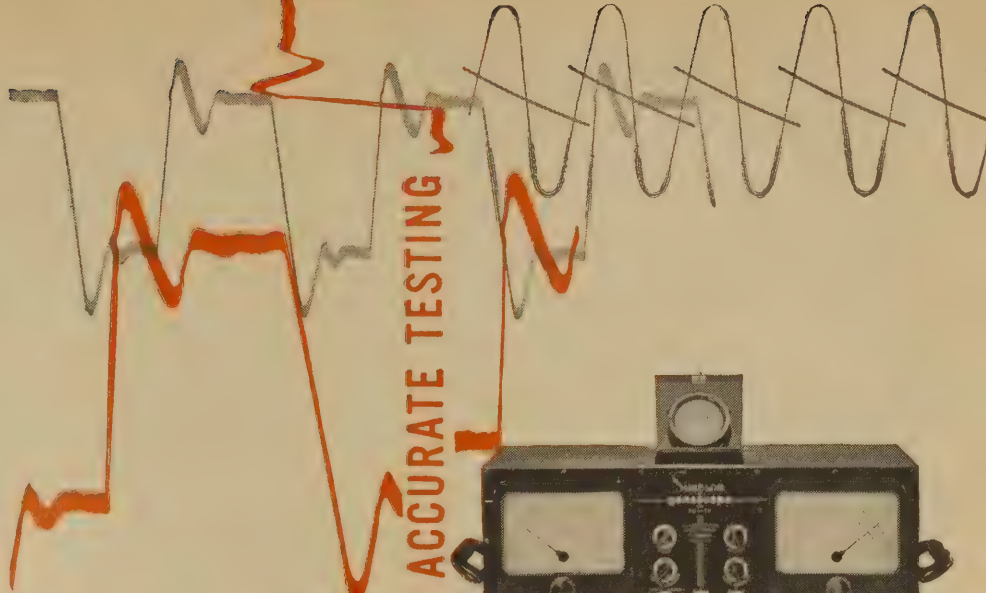
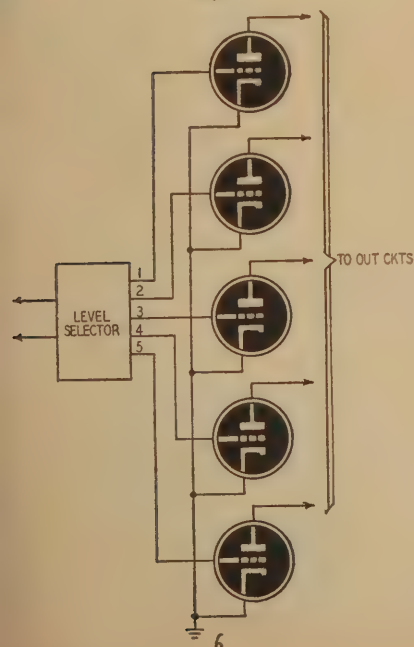
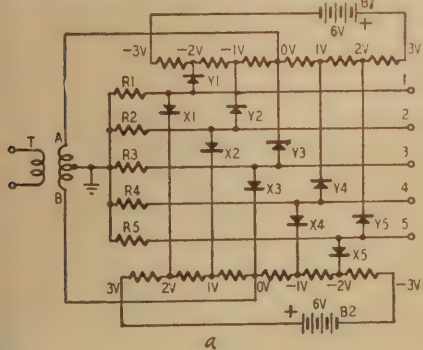
This is a high-speed switch useful in quantizers and oscillograph recorders. It indicates signal amplitude by steps. For example, when the amplitude lies between 0-1 unit, it energizes the "No. 1" circuit. For a level between 1-2 units, "No. 2" circuit is energized, and so on. This indication by steps is called *quantizing*.

See Fig. a. B1 and B2, are 6-v. supplies. All divider resistors are equal, to provide the voltages shown. The upper values are given with respect to point A, the lower ones relative to B. With zero signal at T, these values are also correct with respect to ground.

Note the 5 pairs of rectifiers, X1Y1, X2Y2. . . If a rectifier passes current, it feeds one of the load resistors R1, R2. . . Current through any load can flow in only one direction. In this circuit only one rectifier pair can remain non-conducting at any time. For example, assume zero signal at T. Then X3Y3 is the only non-conducting pair since these have no voltage across them. Line 3 is grounded but all others are negative.

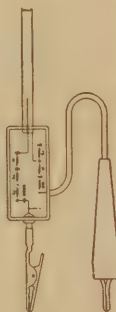
Now assume an input signal. Let A be 2 volts positive and B 2 volts negative. Now the original voltages (marked on the diagram) are changed. The upper values are *increased* 2 volts, the lower values *decreased* 2 volts. Therefore X1Y1, with no voltage across them, are non-conducting. All other Y rectifiers are blocked, but the other X rectifiers have negative cathodes so they conduct. Now Line 1 is at ground potential, but all others are negative. In this way, only one line is at ground potential at any time.

Fig. b shows how the level selector may be connected to a bank of triodes. At any time, only one tube has its grid grounded. All other tubes are blocked by the negative bias on their grids. The tubes may feed an oscillograph. **END**

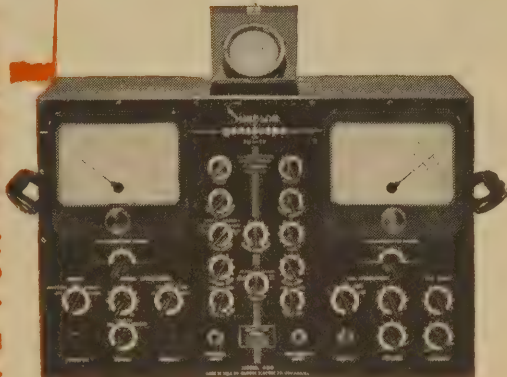


approved by  
service managers of:

admiral  
zenith  
motorola  
emerson  
hoffman  
hallicrafters



SIMPSON MODEL 480 GENESCOPE FOR ACCURATE TESTING



- All the necessary signal sources for alignment of FM and TV receivers • Includes the Simpson High Sensitivity Oscilloscope and high frequency crystal probe for signal tracing • Independent, continuously variable attenuators and step attenuators for both AM and FM units offer complete control of output at all times • 0.15 megacycle sweep is provided by a noiseless specially designed sweep motor based on D'Arsonval meter movement principles • The exclusive Simpson output cable (illustrated) includes a variable termination network, quickly adapted to provide open, 75 or 300 ohm terminations —the addition of a pad provides attenuation and isolation. Use of appropriate resistors across certain terminals will provide any other termination required. A .002 MFD blocking condenser can be added on any termination for use on circuits containing a DC component • The FM generator output voltage is constant within .2 DB per MC of sweep.

dealer's net \$395.00

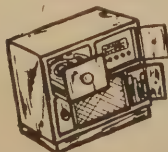
SIMPSON ELECTRIC COMPANY

\$200 W. Kinzie St., Chicago 44, Illinois • Phone: Columbus 1-1221 • In Canada: Bach-Simpson, Ltd., London, Ont.

## "SOUNDCRAFTERS" NEW HIGH FIDELITY F. M. - A. M. RADIO

13 Tubes give you features and power to spare. **\$6750**  
FM tuning range 88-108 megacycles. AM tuning range 535-1650 kc. 14 Watt 6V6 Push-Pull Amplifier. Added RF Tube on FM. Separate input jacks for crystal and reluctance pickups. Will accommodate two speakers (i.e. 1-12" & 1-5" for very high notes—Extra \$2). Its wide range, 30-15,000 cycles, has an excellent Tone Control System using separate Bass and Treble tone controls. Tuner and Amplifier on one chassis makes installation very easy. AM Band has interstation noise control suppression. Phono Motor outlet provided COMPLETE, READY to PLUG-IN including all tubes with a 10" or a 12"

High Quality Speaker. Multicolored slide rule dial. AM Loop Antenna. Knobs, etc. Size 12 3/4 x 10 1/2 x 7 3/4. High. RCA Licensed. New Merchandise. Original Factory Cartons. Immediate Delivery. Fully Guaranteed.



### COMPLETE RADIO-PHONO CONSOLE COMBINATION

**\$16950**  
as shown

With Webster Changer & G.E. Variable Reluctance Pickup. In Mahogany Finish. (\$10 additional for blond.)

JAN ELECTRONIC DIST. CO., 222 FULTON ST., N. Y. 7.

Order Yours Today by Mail or Come in for a Free Demonstration. \$10.00 on C.O.D. Orders.

WO 4-0632



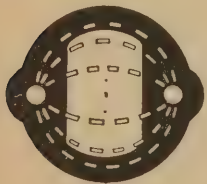
# teamed together for *Better TV Picture Quality*



The combination of the famous Amphenol Inline Antenna with the extremely low-loss Amphenol Tubular Twin-Lead permits any TV set to present the best picture it possibly can.

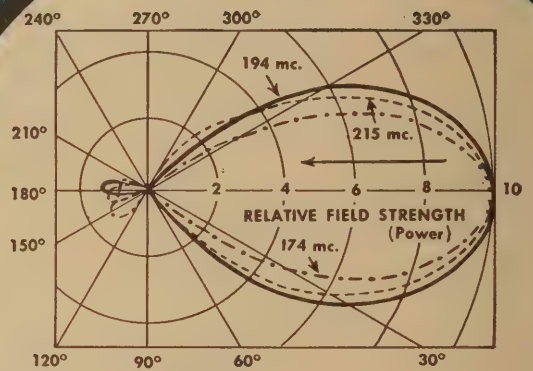
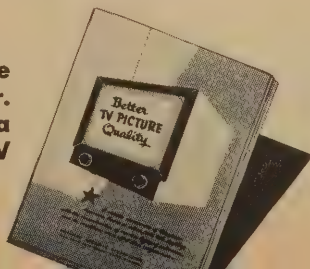
In addition to a strong forward reception lobe, the Inline has uniform gain over the entire range of VHF channels—less variation than the 3 decibel change which causes “fuzziness.” The Inline is also available in stacked array for those fringe or trouble areas which require additional signal strength.

The Amphenol Tubular Twin-Lead provides very low-loss and constant impedance. The tubular construction minimizes the effect of moisture and dirt deposits on the concentrated field of energy and ends weather interference. Because of these characteristics, Amphenol Tubular Twin-Lead has been recommended by leading TV manufacturers and authorities for any installation where UHF is, or will be available.

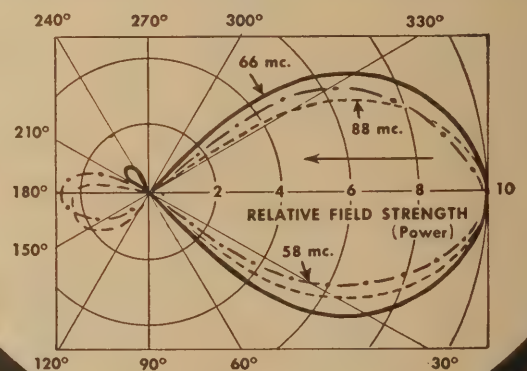


This illustration clearly shows that the concentrated field of energy between the two conductors, which are 7 strands of #28 copper weld wire, is contained by the tubular construction. This important field of energy is unaffected by any exterior conditions.

Your free copy of this book is available from your Authorized Amphenol Distributor. It contains complete factual and test data on the factors which determine Better TV Picture Quality.



consider the evidence..



The test patterns on both high and low bands reveal the Amphenol Inline Antenna's superior uni-directional reception lobe. This single forward lobe intercepts the TV signal at its maximum available strength. It also rejects unwanted reflected signals or side interference that cause “ghosts” and unsteady pictures.

No other broadbanded antenna can present as favorable a reception pattern on *all* the VHF channels as does the Amphenol Inline Antenna.



## TAPE RECORDER

Allied Radio Corp., 833 W. Jackson Blvd., Chicago, Ill., has announced a low-priced tape recorder, the *Knight*. Two speeds and dual-track recording head provide four recording times.

At 3.75 inches per second a 7-inch reel with 1,200-foot tape capacity records continuously for one hour (two hours using second half of tape width). At the fast speed of 7.5 inches per second the recording time is one-half hour continuously and one hour overall.



Frequency response is flat from 70-8500 c.p.s. at 7.5 inches speed and 90-6000 c.p.s. at 3.75 inches speed. Recordings may be made either from the microphone supplied, or direct from radio, FM tuner, or phonograph. Playback is through the built-in amplifier and 5 x 7-inch oval speaker.

The unit weighs less than 22 pounds and operates on any 105-120-volt, 60-cycle a.c. outlet.

## DYNAMIC MIKE

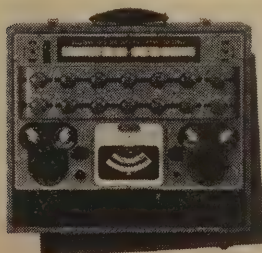
Astatic Corp., Conneaut, Ohio, has announced the *Dynabar* unidirectional dynamic microphone featuring a multi-impedance transformer and impedance selector switch.



The front-to-back pickup differential is approximately 15 db. Impedances provided: 50, 200, 500 ohms and high impedance. Output level of the mike is -54 db (1 volt per microbar); range is 40 to 10,000 cycles. Standard equipment includes Amphenol cable connector and 18 feet of two-conductor shielded cable.

## C-R TUBE ANALYZER

Jackson Electrical Instrument Co., 16-18 Patterson Blvd., Dayton 2, Ohio, is producing a new cathode-ray tube analyzer, model 707. It tests all TV picture tubes, both magnetic and elec-



trostatic deflected types. It also will analyze oscilloscope, radar, and other special-purpose C-R tubes without removal from chassis or carton. The instrument weighs 22 pounds.

## PORTABLE RECORDER

Amplifier Corp. of America, 398 Broadway, New York 13, N. Y., is manufacturing a battery-powered portable tape recorder with spring-wound motor, the Broadcaster model 610-SD.

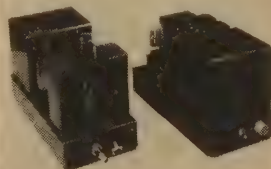
The unit is 11 1/2 inches wide x 10 inches deep x 7 1/2 inches high, and weighs 15 pounds. The flutter content is within  $\pm 0.1\%$  over the full winding cycle of 6 minutes. It operates at a tape speed of 7 1/2 inches per second, furnishing 15 minutes of playing time on a standard 5-inch diameter 600-foot reel of sound recording tape. Recordings may be played back on any a.c.-operated studio equipment at equivalent tape speed. A supplementary speed control provides  $\pm 5\%$  tape speed adjustment.



Recordings can be made while the instrument is in motion or being carried. Headphone monitoring while recording and immediate playback through phones, or into an auxiliary amplifier, speaker, or telephone transmission lines are two features of the unit. Standard phone jacks are used for the high-impedance microphone input and output terminals.

## WILLIAMSON AMPLIFIER

British Radio Electronics, 1 Thomas Circle, Washington 5, D.C., has announced that it is importing the first production version of the Williamson amplifier to be endorsed by the designer.



The amplifier is supplied with specially wound transformers and chokes and with capacitors of approved British Government type. It consists of two units, and weighs 47 pounds.

Metering and balancing arrangements are provided. Jacks and plugs have been supplied from the U.S. to conform to American standards, and replacement parts are available in this country.

## TV CALCULATOR

Pioneer Electronic Supply Co., 2117 Prospect Ave., Cleveland 15, Ohio, has announced a television signal-range



calculator. Designed as a slide rule it shows the approximate Grade A, Grade B, and City coverage for all v.h.f. and u.h.f. television channels.

## SERVICE AIDS

General Cement Mfg. Co., Rockford, Ill., has announced two new service chemicals, one for TV and radio receivers, the other for magnetic recorders.

# BUILD 15 RADIOS AT HOME ONLY \$19.95

With the New Improved 1953 Progressive Radio "EDU-KIT"

NOW INCLUDES  
SIGNAL TRACER  
and  
CODE OSCILLATOR

- FREE TOOLS WITH KIT
- ABSOLUTELY NO KNOWLEDGE OF RADIO NECESSARY
- NO ADDITIONAL PARTS NEEDED
- EXCELLENT BACKGROUND FOR TELEVISION
- 10 DAY MONEY-BACK GUARANTEE



## WHAT THE PROGRESSIVE RADIO "EDU-KIT" OFFERS YOU

The Progressive Radio "Edu-Kit" offers you a home study course at a rock bottom price. Our Kit is designed to train Radio Technicians, with the basic facts of Radio Theory and Construction Practice expressed simply and clearly. You will gain a knowledge of basic Radio Principles involved in Radio Reception, Radio Transmission and Audio Amplification.

You will learn how to identify Radio Symbols and Diagrams; how to build radios, using regular radio circuit schematics; how to mount various radio parts; how to wire and solder in a professional manner. You will learn how to operate Receivers, Transmitters, and Audio Amplifiers. You will learn how to service and trouble-shoot radios. You will learn code. You will receive training for F.C.C. license.

In brief, you will receive a basic education in Radio exactly like the kind you would expect to receive in a Radio Course costing several hundreds of dollars.

## THE KIT FOR EVERYONE

The Progressive Radio "Edu-Kit" was specifically prepared for any person who has a desire to learn Radio. The Kit has been used successfully by young and old in all parts of the world. It is not necessary that you have even the slightest background in science or radio.

The Progressive Radio "Edu-Kit" is used by many Radio Schools and Clubs in this country and abroad. It is used by the Veterans Administration for Vocational Guidance and Training.

The Progressive Radio "Edu-Kit" requires no instructor. All instructions are included. All parts are individually boxed, and identified by name, photograph and diagram. Every step involved in building these sets is carefully explained. You cannot make a mistake.

## PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" comes complete with instructions. These instructions are arranged in a clear, simple and progressive manner. The theory of Radio Transmission, Radio Reception, Audio Amplification and servicing by Signal Tracing is clearly explained. Every part is identified by photograph and diagram. You will learn the function and theory of every part used.

The Progressive Radio "Edu-Kit" uses the principle of "Learn by Doing". Therefore you will build radios to illustrate the principles which you learn. These radios are designed in a modern manner, according to the best principles of present-day educational practice. You begin by building a simple radio. The next set that you build is slightly more advanced. Gradually, in a progressive manner, you will find yourself constructing still more advanced radio sets, and doing work like a professional Radio Technician. Altogether you will build fifteen radios, including Receivers, Transmitters, Amplifiers, Code Oscillator and Signal Tracer.

## The Progressive Radio "EDU-KIT" Is Complete

You will receive every part necessary to build 15 different radio sets. Our kits contain tubes, tube sockets, chassis, variable condensers, electrolytic condensers, mica condensers, paper condensers, resistors, line cords, selenium rectifiers, tie strips, coils, hardware, tubing, hook-up wire, solder, etc.

Every part that you need is included. These parts are individually packaged, so that you can easily identify every item. Tools are included, as well as an Electrical and Radio Tester. Complete, easy-to-follow instructions are provided. In addition, the "Edu-Kit" now contains lessons for servicing with the Progressive Signal Tracer, F.C.C. instructions, quizzes. The "Edu-Kit" is a complete radio course, down to the smallest detail.

## TROUBLE-SHOOTING LESSONS

Trouble-shooting and servicing are included. You will be taught to recognize and repair troubles. You will build and learn to operate a professional Signal Tracer. You receive an Electrical and Radio Tester, and learn to use it for radio repairs. While you are learning in this practical way, you will be able to do many a repair job for your neighbors and friends, and charge fees which will far exceed the cost of the "Edu-Kit". Here is your opportunity to learn radio quickly and easily, and have others pay for it. Our Consultation Service will help you with any technical problems which you may have.

## FREE EXTRAS IN 1953

- ELECTRICAL AND RADIO TESTER
- ELECTRIC SOLDERING IRON
- BOOK ON TELEVISION
- RADIO TROUBLE-SHOOTING GUIDE
- MEMBERSHIP IN RADIO-TELEVISION CLUB
- CONSULTATION SERVICE
- QUIZZES
- TRAINING FOR F.C.C. LICENSE

The Progressive Radio "Edu-Kit" is sold with a 10-day money-back guarantee. Order your Progressive Radio "EDU-KIT" Today, or send for further information.

We pay shipping charges all over the world, if you send check or money order with your order. On C.O.D. orders, you pay cost of delivery.

# PROGRESSIVE ELECTRONICS CO.

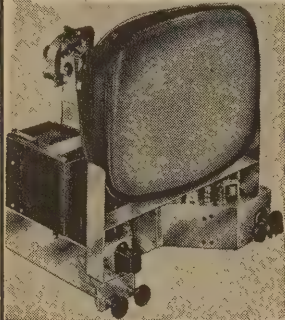
497 UNION AVE., Dept. RE-67, Brooklyn 11, N. Y.



## Great, New 1953 Model 630-DX CHASSIS

terrific savings-immediate delivery

Includes newest developments—Cascode Tuner—30 Tubes—For 16" to 24" Picture Tube—Wonderful Saving! Adaptable for color & UHF!



The great 630 with all the up-to-date improvements! Wonderful reception on long range up to 200 miles, without a booster, is yours today at this low-low price. Gives 3-times normal reception. Special super high-gain standard coil tuner gives greater sensitivity, top performance on any channel. Aligned and tested for 5 hours, molded condensers, 4 microvolts sensitivity, FM sound system, horizontal & linear lock and is directly adaptable for color & UHF.

Model 630 DX-1: RMA Guaranteed—Factory Wired, ready to play. Complete with 12" speaker, hardware and knobs.

**\$149.50** (less CRT)

FREE: New Trouble Shooting book with any chassis!

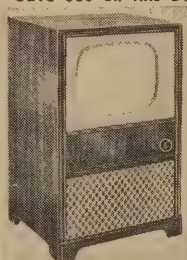
### SUPER 630 DX-2 TV CHASSIS

- Includes the same features as the 630 DX-1 chassis plus the following:
- ★ Keyed AGC level control
  - ★ Cornell-Dubilier plastic molded condensers
  - ★ 4.5 Megacycle wave trap to eliminate interference
  - ★ Phono input & switch which cuts out high voltage supply
  - ★ RCA matched 70° cosine yoke & Hi-Voltage transformer
  - ★ Four (4) 6CB6 tubes in video IF strip
  - ★ RCA 12" PM Speaker

Net price **\$159.50** Complete (less CRT)

Universal Mounting Brackets ...\$5.95

Save \$50 on this Decorator TV Cabinet



Model 200: Original list \$99.95

Blonde finish, add \$10

Also Deluxe Cabinets, write for catalog

For 17", 20" & 21" Picture Tubes—630 or other Chassis.

Every beautiful cabinet is richly finished of hand rubbed mahogany and made by our own cabinetmakers. They are custom styled, guaranteed new & perfect. Includes mask & mounting brackets. Cabinets are also available with blank control panel to fit any chassis.

Now **\$49.50**

### Great Values TV PICTURE TUBES

Full Year's Guarantee—Black Face Brand New, Standard Brands

10BP4	\$19.95	16AP4A	\$32.95	20CP4A	\$35.95
12LP4A	22.95	16GP4	32.95	21EP4A	36.95
14BP4	23.95	16KP4	26.95	24AP4	68.95
14CP4	23.95	19AP4A	39.95	27EP4	92.95

Order now for immediate delivery.



### Rose Co.'s ANTENNA KIT

Saves you many dollars!

New antenna kits contain everything needed for a complete, satisfactory installation. NOW is the time to replace those old rusty worn out antennas with these brand new aluminum jobs. Be ready for the millions of dollars of TV entertainment on the air. Don't miss a single show because of poor reception!

- No. K-21 KIT includes:
- 1-8 element conical antenna
  - 75 ft. highest quality 300 ohm wire
  - 2-5 ft. 1 1/4" steel mast sections
  - 2 mast stand-off insulators
  - 4 screw-eye standoffs
  - 1 all-angle base mount
  - 1 UL approved lightning arrester

No. K-22 KIT includes: Same as above except that it includes 2-8 element conical antennas and 1 set of stacking bars.

Save! Dealer **\$6.99** Net:

Complete Kit

Terrific Buy Dealer **\$9.99** Net:

Complete Kit

Genuine MOLDED CONDENSERS Fresh Stock! All mineral oil filled—Fully molded—100 Centigrade—Meets Jan. C91 tests—

GUARANTEED All 600 Volts

Cap.	per 10	per 100	Cap.	per 10	per 100	Cap.	per 10	per 100
.001	\$ .79	\$6.90	.01	.89	\$7.90	.05	\$1.09	\$9.90
.002	.79	6.90	.02	.89	7.90	.1	1.25	11.50

May be assorted in 100 lots

# THE ROSE COMPANY

100 Park Place — Dept. E-1 — New York 7, N. Y. CORTLANDT 7-6195.

De-Noiz, for radio and TV controls such as volume controls, detents, tuners, switches, relays, and contacts, dissolves



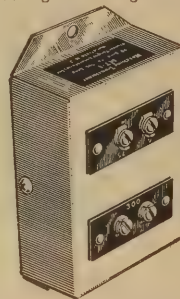
corrosion and oxidation and stops noise.

Mag-netic Head Cleaner, applied to recording heads of tape and wire recorders where it aids in preventing the accumulation of scum, oxides and other residue.

Both products come in 2-ounce sealed bottles, complete with applicator.

### NEW TRANSFORMER

Blonder-Tongue Labs, 526 North Ave., Westfield, N. J., announce a 75-300 ohm matching transformer, model MT-1. The unit provides a 2-times increase in signal voltage and signal-



to-noise ratio when transforming from 75 to 300 ohms. It is built into a small metal case, which may be mounted at the antenna.

### AUTOBOOSTER

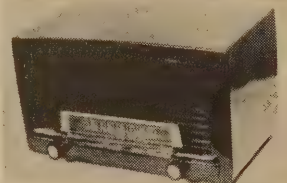
Perma-Power Co., 4721 North Damon Ave., Chicago 25, Ill., is producing a new autoboster transformer which increases picture-tube filament voltage



to 7.8 volts. The unit is designed for use in sets with parallel-wired filaments. The C-Brite is automatic and requires no switching or wiring.

### RADIO KITS

Radio Kits Inc., 120 Cedar Street, New York, N. Y., has announced the new "Q" line, available in kit or completely assembled form. Model QS is



a 1-band receiver or kit with a frequency range of 550-1600 kc; model Q5X is a 2-band receiver or kit with frequency ranges of 550-1600 kc and 6-18 mc.

### SOLDERING IRON

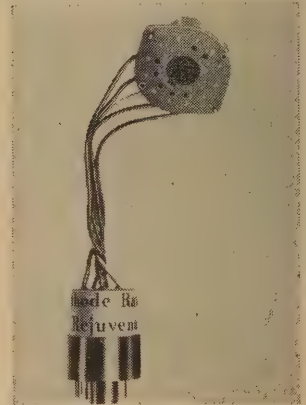
American Electrical Heater Co., 610 Cass Avenue, Detroit 2, Mich., is pro-



ducing an angle type electric soldering iron for light-duty soldering. The iron weighs 10 ounces, has a 1/4-inch plug-type tip, an input of 60 watts, and is available in standard voltages and for 32 volts. A separate heat-insulating stand is supplied with each iron.

### TUBE REJUVENATOR

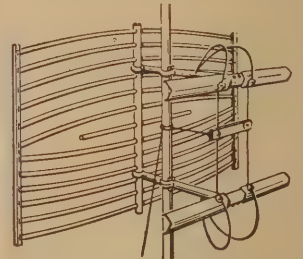
Crest Laboratories, Whitehall Bldg., Far Rockaway, N. Y., has introduced a



new picture-tube rejuvenator, the model D, designed to operate with all series-filament type television receivers.

### V.H.F. ANTENNA

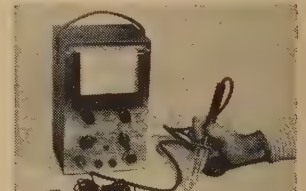
Davis Electronics, 4313 W. Magnolia Blvd., Burbank, Calif., has announced an all channel (2-13) high-gain v.h.f. antenna, the Super-Vision. Manufacturer claims such features as minimum ghosts, 10 db or more gain on high



channels, good front-to-back ratio on all channels. The antenna can be tipped to shift the vertical pattern without tilting mast and can be used with antenna rotator. It is 6 feet, 2 inches high (less mast), 8 feet wide, and 4 feet deep.

### MULTIPLIER PROBE

Insuline Corporation of America, 3602 35th Ave., Long Island City 1, N. Y., has announced a multiplier probe that extends the d.c. voltage ranges of standard vacuum-tube voltmeters 100 times. The device, known as the "100x" has the catalog listing No. 6222.



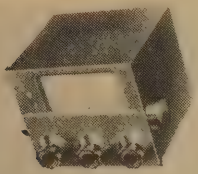
If the meter has a normal top range of 300 volts, it reads up to 30,000 volts with the probe; if it has a range of 500 volts, it reads up to 50,000 volts.

The insulated handle has a finger guard. The probe is 8 1/2 inches long and has a 5-foot flexible cord and accompanying grounding wire. The meter end of the cord has a microphone-type screw-on connector. An adapter plug (No. 33) permits the use of the probe with meters having phone plug connection.

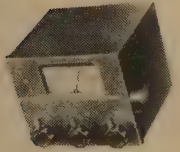
### MOBILE CONVERTERS

Radio Manufacturing Engineers, Division of Electro-Voice, Peoria 6, Ill., has announced three mobile converters for amateurs. Model MC-55 is a five-band





MC-53



MC-57 &amp; MC-53

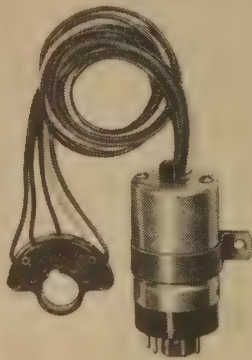
model giving full coverage of bands of 10-11, 15, 20, 40, and 75 meters. Model MC-53, designed for v.h.f., is a three-band converter for 2, 6, and 10-11 meters. Model MC-57 is another 3-band converter for full coverage of the 10-11, 20 and 75 meter bands.

### PICTURE-TUBE BRIGHTENER

Standard Transformer Corp., 3580 Elston Ave., Chicago 18, Ill., is producing the Stancor P-8192 C-R tube booster, a compact, self-contained device designed to add months to the useful life of a television picture tube. The unit can be used with all electro-magnetic picture tubes, regardless of size, where dimming is due to low cathode emission.

Easy to install, the new booster measures only 3 1/2 inches high and 1 1/2 inches in diameter. It does not require a.c. line connection, and is equipped with high-low switch providing two levels of brilliance. Of autotransformer construction, it has 18-inch leads between the booster and the connector plug, allowing the unit to be placed anywhere in the set, and is supplied with bracket and screws for chassis or cabinet mounting.

net mounting. To install, it is necessary only to remove the tube connector and attach it to the booster, then attach the connector plug of the booster to the tube. If there is insufficient brilliance at "low" it is necessary only to flip the switch to "high."



### U.H.F. ANTENNAS

Technical Appliance Corp., Sherburne, N. Y., has two new antennas. The u.h.f. antenna Catalogue No. 3008, known as the Bow-Tie, is a stacked 4-element antenna for maximum gain. The four elements are preassembled to a 4-foot mast section complete with Q-bars, standoff insulators, and fitting an additional 4-foot section of mast included to provide clearance above the roof. The Bow-Low consists of a Bow-Tie antenna with an ultra-efficient all-channel antenna designed for mounting on an 8-foot mast.

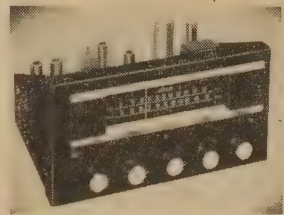
All specifications given on these pages are from manufacturers' data.

### NEW CARTRIDGES

General Electric, Electronics Park, Syracuse, New York, have added three new 15,000-cycle variable reluctance phonograph cartridges to their Gold-Treasure line. These are dual-stylus RPX 053, RPX 061 and RPX 063, the latter two single-stylus cartridges. All three feature retractable diamond styli.

### TUBE TESTER

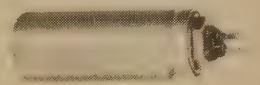
Anko Manufacturing Co., 7311 West Burleigh St., Milwaukee 10, Wis., has announced a new tube tester, the Tele-test, which reduces testing time on most receivers by eliminating switching and set-ups. One meter, with a single scale, indicates "good" and "bad" tube conditions. Picture tubes can be tested through a single adapter cord and plug while in the receiver chassis.



The C800 has a total complement of 15 tubes and can be mounted in the same panel formerly cut for an RC10 or C10 tuner.

### TUBULAR CAPACITORS

Industrial Condenser Corp., 3243 N. California Ave., Chicago 18, Ill., has announced a complete line of single-stud tubular oil-filled capacitors. Added to the line are an 8-μf and a dual 4-μf, 600-volt d.c. capacitor, a 4-μf 1,000-volt d.c. unit, and similar units of the same case size.



### HI-FI FM-AM TUNER

The Radio Craftmen, Inc., 4401 N. Ravenswood, Chicago, Ill., have announced production of the new model C800 high fidelity FM-AM tuner for custom installations. Front-panel controls include equalization for AES, LP, or European recording characteristics, a.c. on-off switch for FM tuning, and continuously variable bass and treble controls from 15 db boost through 15 db attenuation with flat position clearly marked. Also featured is a double shadow tuning eye.

Known as the G and H types, they are oil-impregnated and filled with Indco oil "A". Pyroteen-filled capacitors are also available. Standard capacitance tolerance: +20% to -10%. Temperature range: Indco oil, -40 degrees to +70 degrees C.; Pyroteen, -70 degrees to +90 degrees C. Power factor: Indco oil, 0.4%; Pyroteen, 0.2%.

Catalog and further information available from manufacturer. END

# New RADIO COURSE only \$2.50

## MADE MONEY FIRST WEEK

"You should get more money for your Course. The first week I studied it, I made \$10.00 repairing sets. I built my own test outfit from details given in this course. I have repaired 100 radios to date..."

Signed: Robert C. Hammel, 120 W. 13th, Davenport, Iowa.

## COMPLETED IN 8 WEEKS

"I am very satisfied with the course. When I was at the twelfth lesson I started repairing radios. It took me two months to master your course." From a letter written by Roger Langlois, 1679 Poupart St., Montreal, Canada.

## MODERN, UP-TO-DATE

"Your course is modern and up-to-date. There is not one page in the whole course which anyone can afford to miss. Your course started me on the road to a well paid job and has repaid me many times." Charles Alsapach, 433 Elm St., Reading, Pa.

## AMAZING BARGAIN OFFER

Here is a practical home-study course that will teach you how to repair all radio sets faster and better. These newly reprinted 22 lessons cover all topics just like other correspondence courses selling for over \$150.00. Our amazing offer permits you to obtain the course complete for only \$2.50, nothing else to pay. Easy-to-follow, well illustrated sections on test equipment, circuit tracing, alignment, F.M., use of oscilloscope, amplifiers, and every other topic needed to be an expert in radio repairing. Trouble-shooting hints, circuits, short cuts, service suggestions, new developments. Send coupon today, and use the complete course at our risk. Satisfaction guaranteed. All 22 lessons, in large manual form, + self-testing questions, **\$2.50** complete, your cost only.....

## INTRODUCTION TO TELEVISION

These practical lessons making up this course-book are easy to follow and apply to actual radio jobs. Use this training to get ahead in radio and as an introduction to television. Hundreds of radio facts that puzzled you will be quickly cleared up. You will find yourself doing radio repairs in minutes instead of hours — quickly finding faults or making needed adjustments. Every new radio development of importance and thousands of time-saving radio facts are packed into this complete course-manual. For example, there is a large lesson on servicing F.M. sets and another full lesson on audio amplifiers. Use coupon below to order Course for 10-day examination in your own home. Look over the material, read a few lessons, apply some of the hints. Then decide to keep the lessons at the bargain price of \$2.50 (full-price), or return the material and get a cash refund. (Offer may be withdrawn at any time.)

## Supreme Radio & TV Manuals

Your complete source of all needed RADIO and TV diagrams and service data. Most amazing values. Still sold at pre-Korean prices. Only \$2 for most volumes. Every Radio manual contains large schematics, all needed alignment facts, parts lists, voltage values, trimmers, dial stringing, and service hints. Each TV manual is a practical treatise on servicing the year's sets, with giant blueprints, patterns, waveforms, hints, charts, suggested changes. See coupon at right for a complete list of these low-priced manuals.

## NO-RISK TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 3727 W. 13th St., Chicago 23, ILL.

### Radio Diagram Manuals

- ☐ New 1952 Manual, \$2.50
- ☐ 1951 Radio EACH
- ☐ 1950 Manual } **\$2.50**
- ☐ 1949 Radio

- ☐ 1948 RADIO MANUALS } **PRICED AT ONLY \$2 EACH**
- ☐ 1947
- ☐ 1946
- ☐ 1942
- ☐ 1941
- ☐ 1940
- ☐ 1939
- ☐ 1926-1938 Manual, \$2.50

Send Radio and TV manuals checked ☐ at left and below. Satisfaction guaranteed or money back.

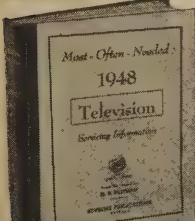
- ☐ Complete RADIO COURSE (22 lessons +) **\$2.50**
- ☐ 1952 Television Manual, \$3. ☐ 1951 TV, \$3.
- ☐ 1950 Television Manual, \$3. ☐ 1949 TV, \$3.
- ☐ 1948 TV, \$3. ☐ 1947 TV & FM, only \$2.

☐ I am enclosing \$..... Send postpaid.

☐ Send C.O.D. I am enclosing \$..... deposit.

Name: .....

Address: .....



# Supreme Publications

Sold by All Leading Radio Jobbers



## SHORT-WAVE PRESELECTOR

A good r.f. preselector can be used with any type of receiver from the simplest blooper to the deluxe superhet to pull those weak dx signals up out of the noise. A two-stage preselector covering from 200 to 10 meters was described by IIAHR in *Rassegna di Radiotecnica* (Ravenna, Italy).

A pair of 1851 pentodes were used in the original model, but you will probably get better results with a 6AC7. The latter is electrically identical to the 1851 with a redesigned grid

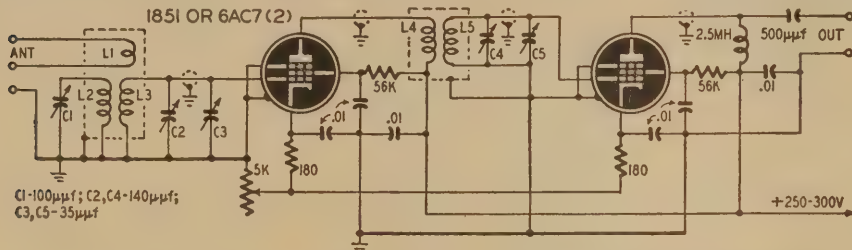
structure for improved high-frequency performance. Gain is controlled by varying the 5,000-ohm resistor in series with the cathodes of the tubes. Selectivity is varied by tuning the 100- $\mu$ f capacitor across L2.

The coils are wound on standard 1 $\frac{1}{4}$ -inch plug-in forms. The antenna coils are on 6-prong forms. Four-prong forms are recommended for the r.f. (interstage) coils to insure that the coils are plugged in to the correct sockets.

Winding data is given in the table. On the antenna coils, L2 is interwound with L3, and L1 is spaced below the

## COIL TABLE

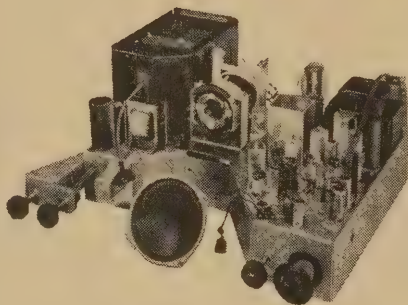
Band (Meters)	Coil	Turns	Wire
200-80	L1	15	22
	L2	32	22
	L3-L5	50	20
	L4	20	22
80-40	L1	7	22
	L2	14	22
	L3-L5	24	18
	L4	10	22
40-20	L1	6	22
	L2	8	22
	L3-L5	11	18
	L4	8	22
20-10	L1	4	22
	L2	4	22
	L3-L5	5	16
	L4	3	22



ground end of L3. Spacing between L1 and L3 is 5/32 inch for 200-80 meters, 1/8 inch for 80-40 meters, 1/4 inch for 40-20 meters, and 1.8 inches for 20-10

## BUY WITH CONFIDENCE FROM EDLIE

## 630 Deluxe 31-Tube TV Chassis



W-22", H-10 1/4", D-17.  
shipping weight 72 lbs.

NATIONALLY KNOWN MFR.

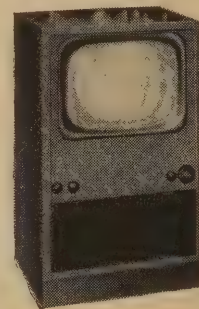
FOR 16" TO 24" PICTURE TUBES

Standard Cascode low-noise Tuner  
70° Cosine Deflection Yoke  
Original 630 Sync Chain gives Stability  
16 KV gives extra brightness and definition  
Fast Action Keyed AGC  
High Fidelity 12" PM Speaker

Closely follows original RCA 630 design, with added improvements ★ ★ ★ ★ ★ ★ ★ ★

COMPLETE with all tubes, hardware, universal mounting brackets, etc. **\$159.50**  
(less C.R. Tube)

Dress Up Your Home With This



Console Cabinet of Artistic Design. Size 40" high x 26" wide x 23" deep. Price including mask and excise tax .... **\$49.95**

Extra for glass .....\$2.75

ONE YEAR GUARANTEE

## Finest Standard Guaranteed Picture Tubes

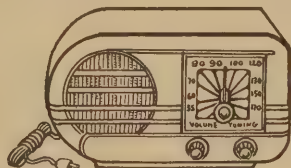
ONE YEAR GUARANTEE

12 1/2" Black or White <b>\$22.50</b>	14" Glass Rect. Black <b>\$23.50</b>	16" Glass Round or Rect. <b>\$22.50</b>	17" Rect. Black <b>\$24.50</b>	19" Round Black <b>\$34.50</b>	20" Rect. Black <b>\$34.50</b>	21" Rect. Black <b>\$36.50</b>	24" Metal <b>\$67.25</b>
---------------------------------------	--------------------------------------	---	--------------------------------	--------------------------------	--------------------------------	--------------------------------	--------------------------

\$\$\$

## MONEY SAVER KITS FROM EDLIE ELECTRONICS

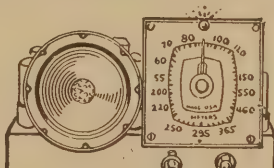
\$\$\$



## 5 TUBE AC-DC SUPERHET KIT

Kit #1—Five Tube superheterodyne kit, A.C.-D.C. contains all components required to construct this latest design, highly sensitive superheterodyne broadcast receiver complete with black bakelite cabinet (excludes wire and solder) .....Price **\$7.95**

Extra for a kit of 5 tubes (12AT6, 12BA6, 12BE6, 35WA, 50C5). Price \$3.25.



## 6-TUBE KIT

Kit #2—A low-priced 6 TUBE KIT designed for high sensitivity, excellent selectivity and good tone quality. Uses 25L6, 25Z6, 6SQ7, 6SA7, 6SK7, 6SK7 in an easily constructed circuit. The 6 Tube Kit is shipped with all parts, including punched chassis, resistors, condensers, coils, sockets, PM Speaker, hardware, etc.

And at a closeout price of only (less tubes and cabinet) **\$6.95**

Extra for matched set of six tubes for kit **\$3.25**

## Electronic Code Practice Oscillator &amp; Blinker Kit

AC/DC or Battery Operated!

Kit #3—One of the most practical Code Practice Oscillators ever designed, yet one of the simplest to build and operate. Can be used with any number of headphones. Adjustable Pitch Control—Any type of headphones can be used. No warmup time—ready to operate instantly. Simple and safe to operate. Operates anywhere—with AC or DC power, or from a 90 volt Miniature Battery. Learn Blinker Code with flashing light. Blinker can be used as signaling device. International Morse Code included.

Kit each **\$1.95** Assembled **\$2.95**

Kit #4—Basic 1 tube training kit. Simple to construct complete with all parts one tube and headset diagrams and instructions included. Use 1-354 tube and a 67 1/2 volt Battery. Price—**\$3.95**  
less Battery—**\$3.95**  
Kit #5—2 tube Amplifier Kit complete with 50L6, 35Z5, and 4" PM to convert Kit No. 1 to a 3 tube set for loud-speaker operation ..... **\$4.95**

## THREE TUBE PHONO AMPLIFIER

Not a Kit!

An assembled unit ready for installation using tone and volume control and six feet of rubber cord ..... **\$2.95**

(Not including Tubes) .....  
With Complete Set of Tubes ....\$3.95

## PHONO OSCILLATOR

Not a Kit!

Wireless phono oscillator transmits recording for crystal pickups or voice from carbon mike through radio without wires. Can also be used as an intercom by using P.M. speaker as mike. Price (excluding tubes) **\$2.95**

With Complete Set of Tubes ....\$3.95

Satisfaction guaranteed on all merchandise. All prices subject to change without notice.

EDLIE ELECTRONICS

WRITE FOR FREE CATALOG

154 Greenwich St.

New York 6, N. Y.



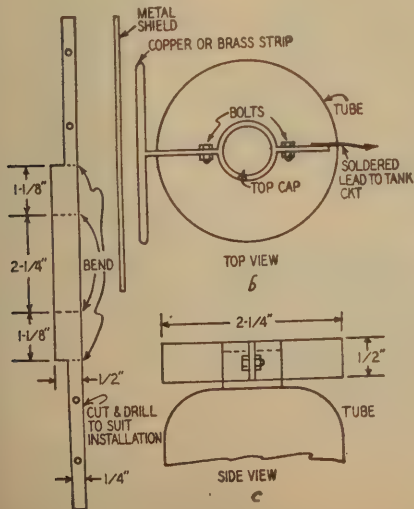
meters. L4 is interwound with the ground end of L5. If the 140- $\mu$ f tuning capacitors are ganged (they should be for easy tuning), L3 and L5 should have exactly the same number of turns and the same winding length. The antenna and r.f. coils should be shielded, and the sections of the 140- $\mu$ f band-set and 35- $\mu$ f bandspread capacitors should be separated by a partition shield to prevent oscillations.

TVI REDUCTION KINK

Most articles on amateur TVI elimination stress the need for very low harmonic output and the elimination of v.h.f. parasitics in the transmitter. Various types of high-pass filters, harmonic traps, and parasitic suppressors have been described. Writing in *The Radio Amateur*, G5JU, a British ham, described a simple device for reducing harmonic output, eliminating parasitics, and increasing the radiation for heat from transmitting tubes.

The device consists of a length of 1/2-inch wide copper or brass strip cut to the approximate shape shown at a, and then bent to shape and bolted to the cap of the tube as shown in drawings b and c. The 2 1/4 x 1/2-inch "plate" is located close to and parallel with the metal shield separating the power amplifier from the driver and other portions of the transmitter. The plate and interstage shield form a small capacitor between the tube plate (anode) and ground. This capacitor bypasses high-order harmonics which may be generated in the tank circuit or fed into the tube via the grid. The inductance of the capacitor lead is exceptionally small, thus minimizing the possibility that the inductance and capacitance of the unit may form a resonant circuit which will accentuate harmonics rather than suppress them.

The effectiveness of the capacitor depends on the area of its plate and the distance between the plate and the grounded shield. When constructed as shown, its capacitance is large enough to bypass harmonics and suppress parasitics without causing any appreciable reduction in the L-C ratio of the plate tank circuit at frequencies be-



# HARVEY

## AUTHORIZED DISTRIBUTOR



Presents the **NEW**  
**RCA WO-88A**  
**OSCILLOSCOPE**  
**THE 5-INCH SCOPE WITH**  
**TRUE SQUARE WAVE RESPONSE**

Unretouched photographs of 60 cycle and 50 Kc square waves reproduced on screens of WO-88A. Note fast return.

A rugged scope of high stability, the WO-88A is ideally suited for general TV servicing as well as production-line applications. The outstanding feature of the WO-88A is its remarkably true square wave response. Other features include:

- Direct-coupled, push-pull, 2 stage vertical amplifier; push-pull horizontal amplifier.
- Frequency-compensated, and voltage-calibrated attenuators.
- Front panel source of 1-volt peak-to-peak calibrating voltages.
- Graph screen scaled directly in peak-to-peak voltages.
- Magnetic-shielded CRT gun to minimize hum pickup.
- Extra-fast sweep oscillator retrace.
- Built-in 60-cycle sweep with phasing control.

Used with the new low capacitance WG-216B probe, the input resistance is 10 megohms, shunted by less than 10 mmfd. The frequency response of the vertical amplifier is flat from dc to 100 Kc; within -3 db at 500 Kc; and within -10 db at 1 Mc. Sweep circuit frequency is provided in four ranges, from 15 cycles to 30 Kc. Deflection sensitivity of the vertical amplifier is 25 rms volts per inch. Operates from 105/125 volt, 50/60 a.c.

Dimensions: 13 1/2" high, 9" wide, and 16 1/2" deep. Weighs 25 pounds.

Complete with Matched Probes, Cables, and Tubes \$159.50

NOTE: Prices Net, F.O.B., N.Y.C. Subject to change without notice.

# Harvey

RADIO COMPANY, INC.  
103 W. 43rd St., N.Y. 36, N.Y. • LU 2-1500

# WANTED

**WE NEED YOUR SURPLUS ELECTRONIC EQUIPMENT**  
**WE PAY TOP \$\$\$ FOR:**

★ RADIO RECEIVERS	★ PLUGS
★ TRANSMITTERS	★ CORDS
★ ARC-1	★ RELAYS
★ ARC-3	★ TELEPHONE
★ ART-13	★ MATERIALS
★ CONTROL BOXES	★ AN CONNECTORS
★ INDICATORS	★ WE BUY
★ CLAMPS	★ ANYTHING!

Write, Wire today! Tell us what you have.  
**TALLEN CO., Inc., Dept. RE**  
**159 Carlton Ave., Brooklyn 5, N. Y.**

## DIAMOND NEEDLES

**\$10.50**  
plus postage

Our main business is the manufacture of diamond styli for broadcasting stations and high fidelity sound equipment. As a service to the general public we offer to retip your present replaceable needle with a genuine, unconditionally guaranteed broadcast quality diamond tip for either LP or Standard records.

Send us your replaceable needle (or complete cartridge except Pickering) together with check or money order for \$10.50 plus 25¢ for shipping.

**THE TRANSCRIBER CO.**  
176 Green Street Dept. R Boston 30, Mass.

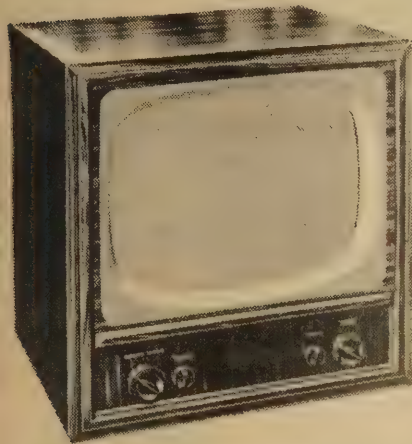






# TeleSound

# CUSTOM TV RECEIVERS

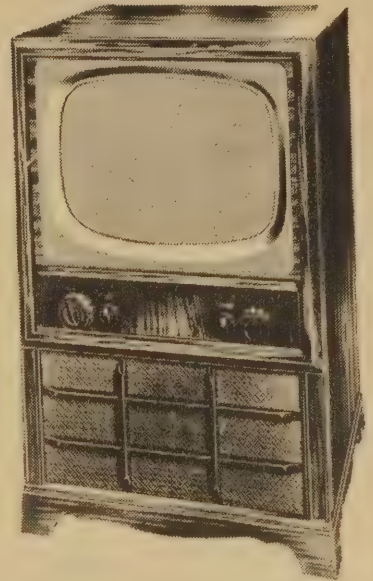


## COMPLETELY ASSEMBLED Super Deluxe DX-TV Chassis in TELESOUND CABINET

with Picture Tube and Speaker—Ready to Operate!

### An Outstanding Line of Fine TV Receivers at Amazingly Low Prices!

Famous Make Super Deluxe DX Chassis features Sensationally new Cascode Tuner ESPECIALLY ADAPTED FOR FRINGE AREA RECEPTION! Gracefully proportioned, smartly styled ribbon stripe mahogany veneer cabinets, with gold picture tube frame.



#### TABLE MODELS

Model T-17 With 17" Picture Tube, Cabinet size: 18" H, 20 1/2" W, 19 1/4" D. Your Net Cost.....\$169.50  
Model T-20 With 20" Picture Tube, Cabinet Size: 24" H, 24" W, 22" D. Your Net Cost.....\$179.50  
Model T-21 With 21" Picture Tube, Cabinet Size: 24" H, 24" W, 22" D. Your Net Cost.....\$184.50

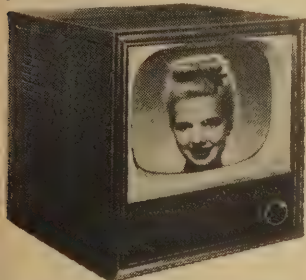
#### CONSOLE MODELS

Model C-17 With 17" Picture Tube, Cabinet Size: 37 1/2" H, 22" W, 19 1/2" D. Your Net Cost.....\$189.50  
Model C-20 With 20" Picture Tube, Cabinet Size: 40" H, 24 1/2" W, 22 1/2" D. Your Net Cost.....\$199.50  
Model C-21 With 21" Picture Tube, Cabinet Size: 40" H, 24 1/2" W, 22 1/2" D. Your Net Cost.....\$204.50

# TeleSound CUSTOM-BUILT TV CABINETS

DIRECT FROM MANUFACTURER TO YOU—COMPARE PRICE and QUALITY!

Be price conscious! TELESOUND Wholesale Prices enable you to sell more, make a BETTER PROFIT for yourself!



H:25", D:21 1/2", W:25" Wgt: 50 Lbs.  
TABLE MODEL 500 .....\$42.00

As above, for 24" Picture Tube  
H:31", D:24", W:27" Wgt: 60 lbs. ....\$55.80



H:40 1/2", D:22 1/2", W:25 1/4"  
Wgt: 60 lbs.  
CONSOLE MODEL 200 .....\$47.50



ALL  
PRICES  
TAX IN-  
CLUDED

H:40 1/2", D:24", W:25", Wgt: 100 lbs.  
CONSOLE MODEL 800 .....\$82.50



## FAMOUS MAKE TV PICTURE TUBES

ALL STANDARD BRANDS—  
NATIONALLY ADVERTISED

FULL ONE YEAR GUARANTEE

DON'T BE MISLED—DEMAND  
GUARANTEED STANDARD  
BRANDS

12 1/2" Black or White .....	\$22.55
14" Glass Rect. (Blk) .....	22.55
16" Glass Round (Blk) .....	33.55
16" Glass Rect. (Blk) .....	33.55
17" Rectangular (Blk) .....	32.45
19" Round (Blk) .....	36.85
20" Rectangular (Blk) .....	39.05
21" Rectangular (Blk) .....	43.45
24" Metal .....	76.45
27" Rect. Wholesale Price on Request	

Nationally  
Advertised

## SUPER DeLUXE TV CHASSIS

—YOUR CHOICE—  
REGAL

or  
VIDEO Model 630K3C



SMASHINGLY  
LOW PRICED!

\$149.50

30 tubes—for 18" to 24" Picture Tubes  
• High Efficiency  
• High Voltage  
• Circuit  
• Keyed AGC

• Automatic brightness control  
• Special extra high gain Cascode Standard Coil Tuner

• Directly adaptable for UHF.  
• 12" Quality Speaker  
• Factory wired, aligned, tested.

• Complete, ready to play, including tubes, knobs and hardware  
• Less CRT

Video 630DX DeLuxe Chassis for extreme fringe area. Complete, \$159.50  
Techmaster C-30 Chassis, Complete with Tubes & Speaker, Less CRT. \$149.50

DeLuxe Techmaster 2431P Chassis. Complete less CRT .....\$199.95  
FREE OFFER! Schematic Diagram and complete 24 page service manual FREE with any of these chassis!

## Here's the "PACKAGE DEAL" You've Waited for!

- ★ SAVE MONEY! Order the cabinet of your choice from the TeleSound models illustrated, in combination with the famous 630 TV Chassis, (Regal or Video), 12" speaker, and your choice of picture tube. If Video 630DX DeLuxe Chassis is desired, add \$10 to combination price. For DeLuxe Techmaster 2431P Chassis, add \$50. Check these sensationally low prices:

CABINET STYLE	COMBINED WITH Super 630 Chassis, 12" Speaker, and	17" CRT	20" CRT	21" CRT	24" CRT
★ 500	\$216.25	\$222.70	\$227.00	\$272.50	
★ 200	\$221.50	\$227.90	\$232.25	.....	
★ 800	\$254.70	\$261.15	\$265.50	.....	
★ 1000	\$254.70	\$261.15	\$265.50	.....	

Please include 25% deposit with orders, balance C.O.D. All shipments F.O.B., NYC  
"Designers & Manufacturers of Custom TV and Radio Furniture"

# TeleSound

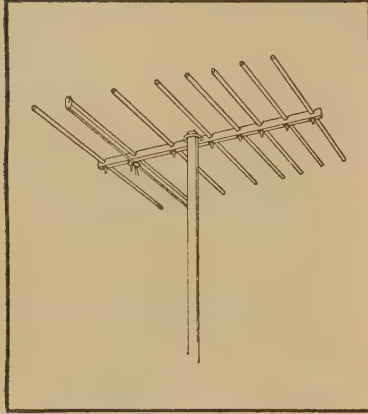
CORPORATION

421 West 28th Street  
New York 1, N.Y.  
Phone: WI 7-0719



# CORROSION... the iron curtain of TV reception

RAIN • SNOW •  
WIND • SEA AIR



One of the major reasons for poor television reception is a corroded antenna . . . and in most cases you won't know when your antenna is corroded.

Corrosion changes the electrical characteristics of the antenna . . . results in imperfect — even poor — reception.

Only with antennas that do not corrode can you be sure of good reception.

Tel-a-Ray antennas can't corrode! They are constructed of Dural, with stainless steel fittings . . . all elements sealed by the exclusive Tel-a-Ray process.

You get perfect television reception all the time. Whether you are replacing a worn antenna or installing a new one — buy Tel-a-Ray.

## Tel-a-Ray Antennas

"FIRST—BECAUSE THEY LAST"

**TEL-A-RAY ENTERPRISES, INC.**  
P. O. BOX 332, DEPT. C, HENDERSON, KY.

**Want Better TV Reception?**  
USE A **Miller** ANTENNA COUPLING TRANSFORMER

### Clearer, Brighter Pictures

when these transformers match antenna impedance to line, or line to TV receiver. Signal input may be improved as much as four times! Designed to couple low-impedance antenna to standard 300-ohm line; or 300-ohm antenna to 72-ohm twin-lead or low-loss 52-ohm coaxial cable. At receiver, low-impedance line matched to standard 300-ohm input. Housed in impregnated, weather-tight aluminum shield.

Dimension: 3/4" by 3/4" by 1-3/8"

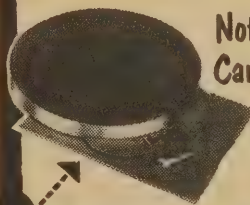
Cat. No.	Impedance Ratio	List Price
6161	52/300 or 300/52	\$2.75
6162	72/300 or 300/72	\$2.75



See your Wholesaler or write us for literature

**J. W. MILLER COMPANY**  
5917 S. Main St., Los Angeles, Calif.

## the TURNTABLE with the HYSTERESIS MOTOR is AGAIN AVAILABLE



Nothing Else Can Compare!

**REK-O-KUT**  
Model T-12H and T-43H

... the only dual speed, 12" turntables that meet the standards for speed regulation and wow content specified by the National Association of Broadcasters . . . and recommended by every leading Sound Authority for use with ULTRA HIGH FIDELITY Amplifiers and Speaker Systems.

T-12H . . . 78 and 33 1/3 RPM \$119.95  
T-43H . . . 33 1/3 and 45 RPM \$119.95

### ACCESSORIES:

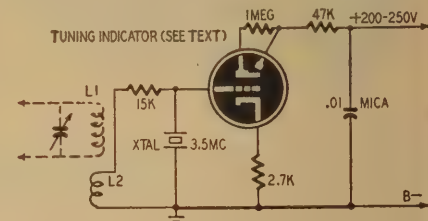
T-103A . . . 45 RPM idler, with record adaptor, interchangeable with 33 1/3 RPM.  
T-104A . . . 78 RPM idler interchangeable with 45 RPM.

**REK-O-KUT CO.**

38-11A Queens Blvd., Long Island City, N. Y.

existing v.f.o.'s. It was developed by GI3EVU and was described in *Short Wave Magazine* (London, England). The original circuit uses a Y63 electron-ray indicator tube. A 6E5, 1629, 6G5, or any similar type may be substituted without changing the values of the components, as the tubes are very similar.

L1 is the oscillator, buffer, or doubler plate coil. L2 is a 2-5-turn link coupled fairly closely to the cold end of L1. Adjust the coupling between L1 and L2 so the eye is almost fully closed when the signal source is tuned to the crystal frequency. Mount the tube so it projects through a hole in the panel close to the v.f.o. tuning dial, and in a position where it will not be obscured by the operator's hand while tuning.



The crystal frequency is not critical as long as it is within the frequency range of the circuit to which it is coupled. A 3.5-mc crystal is perhaps the most useful because it marks the low-frequency end of the 80-, 40-, 20-, and 10-meter bands. If the v.f.o. operates in the 40-meter band, a 7.0-mc crystal should be substituted.

(If you are accustomed to operating close to both edges of any band, you can add suitable crystals to mark the upper edges. The crystal should be connected in parallel with the one shown in the circuit. We have used four 80-meter crystals in parallel to mark the edges of the band and two net frequencies. The crystals do not oscillate continuously, so there is no danger of interaction between them.)

Be sure you know the exact frequencies of the crystals you use. It is highly advisable to borrow a good frequency meter and check the crystals in the marker circuit before you begin operating within a few kc of the band edges. Otherwise the system will have greater dangers than advantages.—Editor)

END



There! That's the kind of topcoat I want!"

RADIO-ELECTRONICS



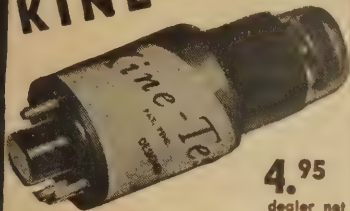
## TEST PICTURE TUBES

**in a jiffy**

- ACCURATE
- INEXPENSIVE
- POCKET SIZE

Test picture tube without removing it or chassis from cabinet.

## KINE-TEST



**4.95**

dealer net

- ELIMINATES GUESSWORK
- TESTS ALL STANDARD TUBES
- SIMULTANEOUSLY CHECKS:

FIRST ANODE VOLTAGE VIDEO SIGNAL  
FILAMENT VOLTAGE BIAS VOLTAGE

Sold only through VIDAIRE distributors

Write for Catalog C

**Vidaire Electronics Mfg. Co.**

Mfrs. of TV color equipment, TV amplifiers,  
Electronic Devices



Factory: Lynbrook, L. I., N. Y.  
Nat'l. Sales Office: 6 E. 39 St.  
N. Y. 16, N. Y. - LE 2-7372

# Carry This ONE Astatic Dual-Output Cartridge

**AND YOU ARE READY  
FOR MOST 78 RPM  
REPLACEMENTS**

Astatic Universal  
Model L-12-U Car-  
tridge—Output Is Low  
(1.2 Volts) with Con-  
denser Harness On; or Slip  
It Off when High Output (4.0  
Volts) Is Needed.

**Y**OU ARE virtually never at a loss when you carry the amazingly versatile Astatic L-12-U Crystal Cartridge. It's the one cartridge that replaces the great majority of 78 RPM units you encounter in your day-to-day business and, at the same time, gives assurance of reproduction qualities better or equal the previous cartridge when new! It isn't a CURE-ALL. But it is the closest thing to it that has been developed since the early days of the industry. It is your best answer for simplification of inventory, for avoiding lost time and problems of servicing, **WITHOUT SACRIFICE OF QUALITY RESULTS.** Performance, in every application, where recommended, is guaranteed by Astatic, the leader.

### EXPORT DEPARTMENT

401 Broadway, New York 13, N. Y.  
Cable Address: ASTATIC, New York

Astatic crystal devices manu-  
factured under Brush Develop-  
ment Co. patents

**THE**  
*Astatic*  
**CORPORATION**  
CONNEAUT, OHIO  
IN CANADA: CANADIAN ASTATIC LTD., TORONTO, ONTARIO

**Get This Valuable Book**

# FREE

Just for Examining COYNE'S New 6-Volume Set



## "Applied Practical Radio-Television"

**ON 7 DAY  
FREE  
TRIAL!**



Yes, you get this big, brand new book, "150 Radio-Television Picture Patterns and Diagrams Explained", absolutely **FREE!** Just off the press! Gives complete wiring circuits and diagrams on the latest Radio and Television Sets. Easy-to-read, large 8½ x 11" pages, with full instructions on how to read and use the diagrams. A "must" in every Radio and Television service-man's repair kit. You get this valuable book as a **FREE** Gift for asking to see Coyne's great new 6-book set, "Applied Practical Radio-Television"!

**Here's "Know-How" That Makes You Worth More!**

You'll get into the big money faster in **TELEVISION-RADIO** if you know where to find the answer to servicing problems. Coyne's great new 6-volume set gives you all the answers—quickly! For basic "know-how" that is easy to understand, you'll find everything you want in volumes 1 to 5 which contain over 5000 practical facts and data. They cover every step from principles to installing, servicing, trouble-shooting and aligning all types of radio and TV sets. So up-to-date it includes **COLOR TV** and **UHF**, adapters and converters.

### 762-Page Television Cyclopedic Included

And then, for speedy on-the-job use, you get volume 6—the famous **COYNE TELEVISION CYCLOPEDIA**. It answers today's television problems on servicing, alignment, installation and others. In easy-to-find ABC order, cross indexed. Use this 6 volume **TV-RADIO LIBRARY** free for 7 days; get the valuable Servicing Book **ABSOLUTELY FREE!**

**SEND NO MONEY!**

Just mail coupon for 6-volume set on 7 days free trial. We'll include book of 150 TV-Radio Patterns & Diagrams. If you keep the set, pay \$3 in 7 days and \$3 per month until \$23.00 plus postage is paid. (Cash price \$22.00). Or you can return the library at our expense in 7 days and owe nothing. **YOU BE THE JUDGE.** Either way, the book of TV-Radio Patterns is yours **FREE** to keep! Offer is limited. Act **NOW!**

### FREE BOOK—FREE TRIAL COUPON!

**COYNE ELECTRICAL & TELEVISION-RADIO SCHOOL, Dept. 13-T1**  
500 S. Paulina St., Chicago 12, Ill.

**YES! Send 6-volume "Applied Practical Radio-Television" for 7 days FREE TRIAL per your offer. Include TV-Radio Patterns & Diagram Book FREE.**

Name.....Age.....

Address.....

City.....Zone.....State.....

Where Employed.....

( ) Check here if you want library sent COD. You pay postman \$22 plus COD postage on delivery. 7-day money-back guarantee.

# COYNE

**ELECTRICAL & TELEVISION-RADIO SCHOOL**

500 S. Paulina St., Dept. 13-T1, Chicago 12, Ill.



## If you're in television

THESE BOOKS CAN BE  
IMPORTANT TO YOU

### Movies for TV

By John Battison. The practical information you need for making the most effective use of movies on TV programs. Explains why some types of pictures are better than others; how to make titles and special effects; what types of lighting to use; various ways to present commercials; causes of technical flaws and how to avoid them; and a wealth of other information on principles, techniques, and equipment. \$5.00

### Painting with Light

By John Alton. A leading Hollywood Director of Photography, winner of the 1951 "Oscar" for photography, explains his professional lighting techniques—what equipment to use and how to place it for a particular mood or effect, indoors or out; how, for instance, to get candlelight or a moving train at night, what lighting to use for rain, for close-ups, and hundreds of other special scenes—information as vital for good TV pictures as for movies. \$6.75

### Mandl's Television Servicing

By Matthew Mandl. Detailed, illustrated instructions for locating and correcting every flaw or failure you're likely to encounter, including those hard-to-find troubles. Simple signal tracing procedures, trade tricks in diagnosing troubles in minimum time, essentials of VHF and UHF servicing, complete master trouble chart. Fully and clearly explains each stage in today's receivers, showing what faults may occur in each and why. \$5.50

### Television for Radiomen

By E. M. Noll. Very clear, non-mathematical explanations of the function and operating principles of every element and circuit in TV reception, together with practical instruction on the installation, alignment, adjustment and trouble-shooting of modern receivers. Provides the THOROUGH UNDERSTANDING of TV needed for effective servicing. \$7.75

### Television and FM Antenna Guide

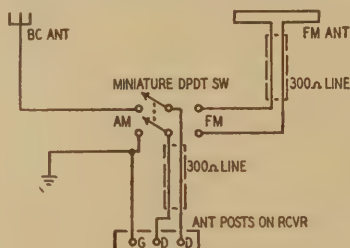
By E. M. Noll & Matthew Mandl. Are interference, fringe reception, ghost reception your problems? This book tells you how to overcome them—how to improve gain, minimize noise from the transmission line, get the MOST out of the antenna system at any location. A brief clear course in antenna theory is followed by instructions for determining the right type of antenna for the site, the best position for it, the right installation, with full, tested data on all types of antennas including those for UHF and VHF locations. \$6.25

See these most helpful books at your book store, or write for non-approval copies to

THE MACMILLAN COMPANY  
60 Fifth Avenue, New York 11, N.Y.

### AM-FM ANTENNA SWITCHING

When using an AM-FM broadcast and shortwave receiver such as the Hallicrafters SX-62, a miniature d.p.d.t. knife switch will enable you to switch quickly from a long-wire short-wave or broadcast antenna to a 300-ohm FM dipole without introducing mismatch between the 300-ohm lead-in and receiver. When the switch is wired as shown in the diagram, throwing it to the AM position automatically connects the G (ground) terminal to one

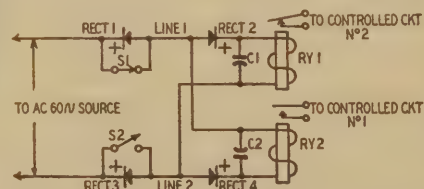


of the D (dipole) terminals. The short is removed and the 300-ohm lead-in connected when the switch is thrown to FM. I used a switch mounted on an insulated block measuring only 1 x 1 1/4 inches. The spacing between its blades is only 1/2 inch. This preserves the symmetry of the 300-ohm ribbon and minimizes reflections and mismatch. The switch is mounted on a polystyrene angle bracket at the rear of the receiver.—Arthur Trauffer

### NOVEL CONTROL CIRCUIT

Because of distance or other factors, it is often impractical to run more than two control leads to a remote electrical device. With the usual circuitry, the two leads would be required to control a single device. This circuit shows how this same pair of lines may be used to control two separate devices.

With S1 and S2 open, the rectifier polarities prevent current flow through either relay rectifiers. When S1 is closed, rectifier 1 is shorted out. Rectifier 8 conducts when the negative half-cycle of the line voltage makes its cathode negative. At the same time,



rectifier 2 conducts because its anode is positive. These two rectifiers pass current through relay 1 and cause its contacts to operate. Relay 2 operates when S2 is closed. Both relays operate when S1 and S2 are closed. C1 and C2 may be of any value large enough to keep the relays from chattering.

To avoid insulation problems and heavy lines, you may use low-voltage relays and supply the circuit from a step-down transformer.

D.c. may be used as the power source, thus eliminating rectifiers 1 and 3. Circuits are selected by reversing the polarity of the applied voltage. With d.c. operation, it is impossible to operate the relays simultaneously.—Carleton Phillips

## Thousands depend on PHOTOFACT! THEY TELL YOU WHY

Unsolicited letters tell what the world's finest TV and Radio Data means to Service Technicians



William T. Duarte  
8 Harbour Road  
Johnston, R. I.

"Thanks for introducing me to such a well-compiled and tremendously helpful data service as your PHOTOFACT."



N. A. Jacobsen  
562 Martha St.  
Grand Rapids, Mich.

"Your folders were recommended to me by another serviceman. I'm discovering that I should have them before I tackle any job that looks the least bit tough. It sure was my lucky day when I was introduced to your folders. Really, I don't know how one could service a set intelligently without having the PHOTOFACT Folder on it."



John J. Duplex  
Duplex TV & Radio  
5153 W. Huron St.  
Chicago, Ill.

"I find your PHOTOFACTS a necessary must, and would not consider servicing without them."

**NOW! GET THE PROOF FOR YOURSELF!**

**FREE**

We'll send you a Free Photofact Folder on any receiver listed in "PF Index & Technical Digest."

Learn for yourself—at our expense—how PHOTOFACT pays for itself by earning bigger repair profits for you! Select any Folder from the PF Index (if you haven't an index, get a copy from your distributor). When you write us for your Free Folder, be sure to state Photofact Set and Folder Number as shown in the Index. Get your Free Folder now. Examine, use, compare—see why you can't afford to be without PHOTOFACT!

HOWARD W. SAMS & CO., INC.  
2205 E. 46th St., Indianapolis 5, Ind.

**HOWARD W. SAMS & CO., INC.**



# DON'T BUY A #630 TV CHASSIS, KIT, CABINET, C.R.T. OR PARTS!

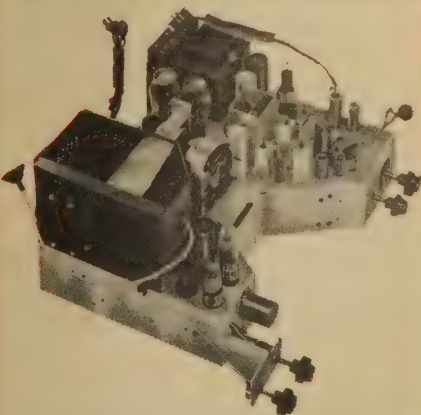
**UNTIL** . . . you receive our FREE copy of . . .  
"HIGHLIGHTS OF TV OFFERS FOR 1953"

#630 TV KITS COMPLETE WITH TUBES . . . as low as \$93.78  
CUSTOM-BUILT TV CABINET for any TV . . . as low as \$39.89  
PICTURE TUBES in factory sealed cartons . . . as low as \$18.36

COMPLETE #630 TV RECEIVERS . lower than ordinary TV Sets  
RADIOS . TV & RADIO PARTS . TEST EQUIPMENT at wholesale

## Brooks LIFE-SIZE Edition

#630 TV KIT BUILDER - SET OF INSTRUCTIONS



BUILDING YOUR OWN #630 TV CHASSIS is now simplified with this COMPLETE SET OF BUILDING & WIRING INSTRUCTIONS. Covers all #630's, from the RCA 10" SET to the latest SUPER DE LUXE 31-tube 16" to 24" RECEIVER.

EVERYTHING AT A GLANCE—LAYOUT CHARTS show chassis and components in actual LIFE-SIZE with instructions alongside the illustrations.

GUESSWORK IS ELIMINATED by specially prepared SCHEMATIC DIAGRAMS, LOCATION GUIDANCE, CODE CHARTS, ALIGNMENT PROCEDURE and TOP AND BOTTOM PHOTOGRAPHS OF A COMPLETED CHASSIS (assembled from these instructions) clearly showing placement of each component.

INDISPENSABLE for BUILDING, CONVERTING or TROUBLESHOOTING any #630 TV SET.

Popular priced at only..... **\$2.49** Postpaid

Including "HIGHLIGHTS OF TV OFFERS FOR 1953"

For better all around performance

## THE NEW CASCADE TUNER

can now be installed in ANY TV set with the

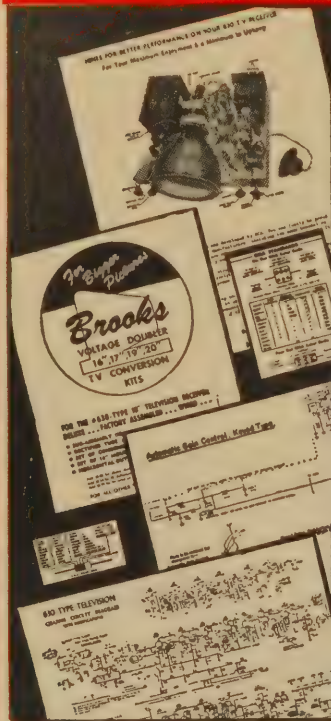
**Brooks CASCADE MANUAL**

Illustrations, Schematics and easy to follow, step by step Instructions

only **50c** Postpaid

Including "Highlights of TV Offers for 1953"

## HOTTEST TV PACKAGE for "ONE BUCK"!



EVERYONE INTERESTED IN TELEVISION should own this TV literature package . . . The information will be found useful on any make TV set. It's different and right to the point. It carries instructions that are up to the minute and not yet found in expensive text books. Indispensable to the TV technician yet easy enough for anyone with even a limited knowledge of TV to understand and follow.

SAVE MONEY ON REPAIRS—Important common occurrences are carefully analyzed and corrective procedures are suggested. You are told what to do—WHEN THE RECEIVER FAILS TO OPERATE, WHEN THERE ARE GHOSTS, INTERFERENCE, NO PICTURE, PICTURE FOLD-OVER, NO RASTER, PICTURE BLOOMS, DISTORTED PICTURE, PICTURE ROLLS, NO SOUND, DISTORTED SOUND, CORONA EFFECTS, ETC. PICTURE TUBE ASSEMBLY and PATTERN ADJUSTMENTS are outlined in detail (the ion trap adjustment caution may save you the price of a new picture tube). The HORIZONTAL SYNC, RCA TUNER and STANDARD TUNER step by step adjustments alone are worth many times the cost of this package.

TUNING GUIDANCE and ANTENNA ADVICE will enable you to enjoy peak performance at its best. The HIGH VOLTAGE CAUTION will give you that free and easy feeling of safety while handling the chassis or any of its parts.

Just think of being able to convert any 10" TV set into a life-size 24" receiver in as little as one hour . . . The ILLUSTRATED TV CONVERSION MANUAL makes that possible.

The #630 CIRCUIT DIAGRAM, KEYED AGC DIAGRAM, RESISTOR & MICA CODE CHARTS need no emphasis as to their usefulness.

YOU HAVE NOTHING TO LOSE. YOUR MONEY WILL BE CHEERFULLY REFUNDED IF NOT COMPLETELY SATISFIED.

- Hints for Better Pictures on 630TV
- 630TV Diagram with Modifications
- Illustrated TV Conversion Manual
- Pulse Keyed AGC Circuit Diagram
- RMA Resistor & Mica Code Charts

All for only **\$1.00** Postpaid

Including  
"Highlights of TV Offers for 1953"

## USE HANDY COUPON

**BROOKS RADIO & TELEVISION CORP.**  
84 Vesey St., New York 7, N. Y.

Enclosed find \$ ☐ Cash ☐ Check ☐ M.O.

Please send items checked, also include your added free copy of "PICTURE TUBE INTERCHANGEABILITY and REPLACEMENT GUIDE" and of course your "HIGHLIGHTS OF TV OFFERS FOR 1953."

HOTTEST TV PACKAGE for "ONE BUCK" ☐  
Brooks LIFE-SIZE Instructions for \$2.49 ☐  
Brooks CASCADE MANUAL for 50¢ ☐

Name \_\_\_\_\_ (please print)

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

**BROOKS RADIO & TV CORP.** 84 Vesey St., New York 7, N.Y.





### FOR FINEST TV RECEPTION

FOR USE WHEREVER TOUGH WEATHER CONDITIONS PREVAIL  
TESTED AND RECOMMENDED FOR FINEST UHF—VHF RECEPTION

**GOODLINE SHEATH-LEED**—a NEW DON GOOD PRODUCT—is our fine Standard \*GOODLINE AIRLEAD encased in a tubing of pure polyethylene of finest quality to protect it under all-weather and all-climatic conditions. It is especially recommended for use in coastal areas where salt spray encrusts the regular leadline, in hot humid areas, where much alternate rainfall and strong sunlight prevails and where leadlines are subjected to frost, snow and icy conditions.



Exhaustive tests made after two years have shown that the average flat or round 300 ohm leadline installed within two blocks from the ocean will give but 2 to 4 weeks of satisfactory operation due to salt spray deposits encrusting the leadline. With GOODLINE SHEATH-LEED protection, the product gives highly satisfactory service for a year and more.

For finest trouble-free reception—even in areas where more favorable weather Prevails—INSIST UPON HAVING GOODLINE SHEATH-LEED INSTALLED FOR YOUR LEADLINE.

**NO. 803-GS SHEATH-LEED:** STANDARD BROWN GOODLINE AIRLEAD. Sheathed in pure Polyethylene Standard Brown LEED-SHEATH (another new Don Good product). For 300 ohm use. 1,000 foot reels—standard length... Shorter lengths available.

**NO. 823-GS SHEATH-LEED:** Color—Golden-Clear Goodline Air Lead. Sheathed in Silver-Gray Pure Polyethylene LEED-SHEATH (another new Don Good Product). GOLDEN-CLEAR GOODLINE AIRLEAD is electronic polyethylene in its purest form, and when shielded from ultra-violet light with Silver-Gray LEED-SHEATH, the installation will give years of trouble-free service. For 300 ohm use. 1,000 foot reels—standard length... Shorter lengths available.

**NO. 733-GA: \*GOODLINE AIRLEAD.** THE BASIS OF FINEST TV RECEPTION. FEATURES: 1—Sharp, clean, "snow-free" pictures—with 80% of loss producing dielectric web removed. 2—Correct impedance for "ghost-free" reception. Nominal 300 ohms. 3—Lower in cost than other leadlines purported to accomplish same results. 4—Correct spacing for minimum radiation loss. Less than 1% of operating wave length. 5—Fully insulated—approved by safety experts. 6—Pure, electronic polyethylene insulation—specially treated by our chemists for extreme weather. 7—Highly efficient conductors: Flexible, stranded—to insure long life. 8—Easily installed with standard insulators. 9—Packaged: 100'—250'—500'—1,000'—2,500'. Colors: Standard Brown, Golden-Clear and Silver-Gray.

IF YOUR JOBBER or TV DEALER CANNOT SUPPLY, WRITE FOR SAMPLES AND NEW LITERATURE

\*Patent Pending. \*Trade Mark. U.S. and Foreign Patents Pending

EXCLUSIVE LICENSEE AND SOLE MANUFACTURER

**Don Good, INC.**

1014 FAIR OAKS AVENUE  
SOUTH PASADENA, CALIFORNIA

#### OUTSTANDING GOODLINE PRODUCTS:

DON GOOD, INC. Manufacturers: Sheath-Leed & Leed-Sheath Protection. Goodline Airlead.

## TUBES

### STANDARD BRANDS NEW INDIVIDUALLY BOXED

1A6	....	.48	6AU6	....	.59	12AU7	..	.85
1B3	....	.84	6AV6	....	.49	12SA7	..	.68
1C6	....	.53	6BC5	....	.61	12BA7	..	.89
1C7	....	.58	6BG6	....	1.85	12SK7	..	.63
1D5	....	.47	6BQ6	....	1.15	12SQ7	..	.68
1D7	....	.68	6CB6	....	.58	12SN7	..	.73
3Q4	....	.52	6H6	....	.50	35L6	..	.51
5Y3	....	.47	6J6	....	.71	35W4	..	.43
5U4	....	.58	6K6	....	.63	35Z5	..	.47
5V4	....	.93	6SJ7	....	.68	50B5	..	.51
6A8	....	.89	6SN7	....	.80	50C5	..	.51
6AC7	....	1.02	6V6	....	.63	50L6	..	.57
6AG5	....	.78	6W4	....	.58	75	..	.40
6AK5	....	.89	6X4	....	.48	955	..	.83
6AL5	....	.58	12AT7	....	.78	1N34	..	.52

Write For Free New Catalogue

GENERAL ELECTRONIC DIST. CO.  
98 Park Place—New York 7, New York

### SOUNDTRONICS SPECIALS

**2 METER RECEIVER KIT**—Completely wired IF strip (H.F. Arc 5). Contains mixer, 1st IF amp and 2nd IF amp, Det., AVC, squelch, 1st AF & squelch amp, 2nd AF. Completely wired front end (Mailory induct. RF range 52-218 Mc). Complete with all diagrams, output trans., Data, lay-outs, etc., less tubes, speaker and power supply (tube complement: 636-6CB5, 717, (or 6AC5), 68G7, 6SH7, 2-6SL7 and 6V6). ..... Only \$9.95

**TOP BRAND 557 CERAMIC TRIMMERS**  
15-65 mmfd or 1.5 to 7 mmfd. .... 15¢ ea.

**CENT. STYLE 823 AN TRIMMERS**—20-125 mmfd. .... 34¢

**TUBULAR TYPE TRIMMERS**—5-5 mmfd. .... 9¢

**TOP BRAND BUTTON MICA**  
Type CB 500 mmfd. 9¢ type FA 2000 mmfd. 14¢

**MUTER CERAMIC CONDENSERS**—5¢ ea.

15, 22, 33, 56, 75, 82, 180, 220 mmfd. .... \$4.50 per C.

**NEW STANDARD BRAND RESISTORS**  
1/2 W 2.5¢ 1 W 3.9¢ 2 W 4.9¢

No Min. Order Req. Quantity Discounts

**TOP BRAND**—1 mfd. 1000 W. V. D. C.—6¢ ea. 5 for 25¢

**HAIR FELT FOR SOUND WORK**—12" x 24" x 1/2"—12¢ ea.

**SPECIAL ASSORTMENTS**  
50 new pop. type ceramic conds. } Your Choice

50 small pop. type ceramic conds. } \$1.49 ea.

All voltages and cap. }  
50 postage stamp mica conds.

Terms—25% w/order, balance C.O.D.

**SOUNDTRONICS LABS.** 632 Arch St., Phila. 6, Pa.

MA-7-2775

### CORONA DISCHARGE

Corona discharge in some TV sets and oscilloscopes is annoying because its effects are often mistaken for other faults and its source is sometimes hard to localize. In a TV receiver, this trouble is likely to cause breaks in the line structure of the raster, variations in brightness, and sometimes irregular black bars on the screen. In a scope, it causes variations in intensity and erratic breaks in the trace. You may hear clicks or frying sounds from the high-voltage compartment or the base of the C-R tube.

If corona discharge is suspected, sniff around the back of the set. If you smell ozone, turn out the lights and look over the power supply, the C-R tube and rectifier sockets, and the high-voltage leads. Watch for a bluish glow. Try blowing your breath on the high-voltage points. A soda straw or piece of spaghetti is handy for this.

When you locate the source of trouble, dress down all sharp corners and edges and smooth off rough solder joints with a hot iron.

If the discharge is on an insulator, replace it because it has probably broken down under the high potential. Discharge from a lead can be cured by replacing the lead with one designed for high-voltage operation. Keep the lead as much in the clear as possible. If this fails, try increasing the size of the offending conductor or connection. Keep everything as large and smooth as possible.—R. A. Cunningham

### WELLER SOLDERING GUNS

If your Weller soldering gun is slow in heating, look at the nuts that hold the tip in place. If they are the least bit loose, they will introduce enough resistance into the circuit to seriously reduce the tip current. Try tightening these nuts with a wrench and note how quickly the gun heats up.—Charles Erwin Cohn

### TV HIGH-VOLTAGE TROUBLES

Sometimes the 1B3-GT/8016 rectifiers fail to light under load in sets having flyback power supplies. This may be caused by a poorly soldered connection in one of the filament pins. The resistance of the connection may be high enough to produce a serious drop in filament voltage. A remedy for this condition is to reheat the filament pins with a hot soldering iron.—Leonard Pfeiffer

### PRECISION RESISTORS

Replacement heating elements for electrical appliances such as small radiant heaters and hot plates can be used to make excellent high-wattage precision resistors for meter shunts and multipliers. When fully stretched out, the wire has a resistance of about 0.2 ohm per inch. The wire can be wound around a ceramic or bakelite tube. Screw-type terminals make the best connections.—Richard J. Sandretto END

RADIO-ELECTRONICS



THE *Original* AND *Only*

**CO-Lateral**

**TV ANTENNA**

PATENT 2,374,187

**FINCO**

*imitated but  
never equalled!*

**ONLY FINCO GIVES  
YOU CONFIDENCE IN**

*Performance!  
Quality!  
Sales Reputation!*

• in fringe areas  
tens of thousands  
of FINCO CO-Lateral  
installations have proved  
FINCO superiority!

**The FINNEY Company**

4612 ST. CLAIR

CLEVELAND 3, OHIO



HOW FAST you work

HOW WELL you work

HOW MUCH money you make

depends a whole of a lot  
on your ability toUSE ELECTRONIC  
TEST INSTRUMENTS  
effectively!

**BASIC ELECTRONIC  
TEST INSTRUMENTS**  
by Rufus P. Turner  
New and completely  
revised edition, 255  
pages, 6" by 9".  
Price \$4.00.

Everything you  
need to know  
about ALL instrument  
types used in modern  
Radio-TV service:

- 1—Simple Meters for  
Current & Voltage
- 2—Ohmmeters & Volt-  
Ohm-Milliammeters
- 3—Vacuum-tube  
Voltmeters
- 4—Power Measurement  
& Meters
- 5—Impedance Meters  
& Measurements
- 6—Capacitor Checkers
- 7—Inductance Checkers
- 8—Special-purpose  
Bridges & Accessories
- 9—Oscilloscopes and  
Their Uses
- 10—R-F Test Oscillators  
& Signal Generators
- 11—Audio Test Oscilla-  
tors
- 12—Measuring Radio  
Frequencies
- 13—Measuring Audio  
Frequencies
- 14—Audio-Amplifier  
Testing Devices
- 15—R-F Signal Tracers
- 16—Tube Characteristics  
& Tube Checkers

## 10-DAY FREE EXAMINATION

Dept. RE-13, RINEHART BOOKS, Inc.,  
Technical Division,  
232 Madison Ave., New York 16, N. Y.

Send Turner's BASIC ELECTRONIC  
TEST INSTRUMENTS for 10-day FREE  
EXAMINATION. If I decide to keep book,  
I will then remit \$4.00 plus postage. Otherwise  
I will return book postpaid promptly and owe  
you nothing.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City, Zone, State \_\_\_\_\_  
Employer's Name and Address \_\_\_\_\_

OUTSIDE U.S.A.—Price \$4.50, cash only. Money  
back if book is returned postpaid in 10 days.

Here at last is a complete  
line-up of how-to-use-it data  
on ALL TYPES OF MODERN  
SERVICE INSTRUMENTS!

In complete, easily under-  
stood terms, you learn all  
about over 80 different in-  
struments. You are shown ex-  
actly when, where, why and  
how to use them—on all kinds  
of service jobs.

You discover how to  
use familiar instruments  
more fully.

And you gain a first-hand  
working knowledge of the many  
newer types such as  
grid-dip oscillators, TV sweep  
and marker generators, TV lin-  
earity pattern generators, dis-  
tortion meters, square wave  
generators and others that are  
so essential in servicing to-  
day's complicated equipment.

What Instrument  
To Use . . .  
How to Use It Properly

To the beginner, BASIC  
ELECTRONIC TEST IN-  
STRUMENTS offers complete  
training in modern instrument  
usage. To the more experi-  
enced serviceman, it is a  
handy reference book that can  
more than pay for itself in  
time saved on a single job.  
Each subject is covered from  
a practical service standpoint  
—NOT just as an instrument  
manufacturer's instruction  
manual. You learn the limita-  
tions of each instrument as  
well as its advantages! 171  
photos, data tables and sche-  
matics help make things as  
clear as A-B-C.

And here are some of the  
book's EXTRA "how-to-do-it"  
features: How to measure re-  
sistance with a current meter;  
how to check power drain  
easily and quickly; how to  
measure R-F impedance with  
a simple T-network; how to  
check frequency with a "scope";  
how to calculate a shunt or  
multiplier; how to calibrate  
meters . . . and dozens of  
other subjects.

Read it for 10 days at our  
risk! Clip 10-day examination  
coupon and send to: Rinehart  
Books, Technical Division,  
Dept. RE-13, 232 Madison  
Ave., New York 16, N. Y.

## RHOMBIC ANTENNA QUERY

? I am about 200 miles from TV  
stations on channels 2 and 5 in Atlanta,  
Ga. The receiving antenna is a  
rhombic with 55-foot legs terminated  
with a 789-ohm resistor and fed with  
300-ohm ribbon line. The antenna is  
45 feet wide at the center. I seldom  
get a picture, but when I do, reception  
is fair on channels 2 and 5. Is there  
any way in which I can modify the  
antenna to improve reception on chan-  
nel 2?—D. A. D., Knoxville, Tenn.

A. We assume that your rhombic is  
as large as you can conveniently make  
it, so we won't suggest making it larg-  
er. Its proportions are good and we  
would not suggest changing them. You  
may be able to improve reception by  
careful orientation of the antenna and  
by correctly matching the antenna to  
the transmission line.

A rhombic antenna for dx reception  
is very critical and must be oriented in  
the vertical and horizontal planes so  
the main lobe points directly at the  
transmitting station and lines up with  
the angle of arrival of the incoming  
signal.

Horizontal orientation or alignment  
of a rhombic is an exacting task when  
the installation is beyond the line of  
sight from the transmitter. Buy (from  
a local airport or aviation supply  
house) a regional airways navigation  
map showing the receiving and trans-  
mitting locations. Mark these points  
on the map and draw a straight line  
between them. Use a protractor to  
measure the angle that this line makes  
with magnetic north. Use the bearing  
of this line in laying out the base line  
of the rhombic. A surveyor will prob-  
ably stake out the antenna base line  
for about the same fee as would be  
charged by a local TV technician for  
a standard antenna installation. If you  
do not care to hire a surveyor for the  
job, a surplus military marching com-  
pass can be used to lay out the antenna  
location. When laying out the base  
line, be sure that the compass is not  
thrown off by magnetic-metal tools,  
keys, belt buckles, and the like. Keep  
such material as far as possible from  
the compass. Make several sightings  
from the same point and lay out the  
base line midway between the two  
extremes.

Since you do not know the angle of  
arrival (wave angle) of the incoming  
signal, you will have to adjust the  
antenna after it is erected. The sup-  
porting lines for the sides and the  
terminated end should run through  
pulleys fastened to the tops of the  
supporting masts. This enables you  
to tilt the plane of the antenna and  
adjust its wave angle to correspond  
with the angle of arrival of the TV  
signal. For your antenna, the termi-  
nated end should be about 18 feet lower  
than the end to which the lead-in is  
connected. You can adjust the plane  
of the antenna for best reception and  
least noise when receiving a signal.  
Keep the terminated end at least 10  
feet above ground.

STAN-BURN  
ELECTRONICS

## ANTENNAE SPECIALS

DOUBLE V 3/8"	1-11	12 or more
DOUBLE V 3/8" Dowel	\$2.98	\$2.20
DOUBLE V 1/2" Dowel	3.45	2.45
10 Element Conical 3/8"	3.95	2.95
Folded Hi Straight Low Quick Rig	4.25	3.25
1/2" elements	4.95	3.75
WINDOW CONICALS	MASTS	
5 FOOT SWEDGED	.79	.69
10 FOOT PLAIN	1.39	1.29
55 Mil. 300 OHM	TV WIRE	
72 OHM COAXIAL		\$14.95 M Ft.
		45.00 M Ft.

## CATHODE RAY TUBE SPECIALS

Standard Brands—Unconditionally Guaranteed			
Type	Dealers Cost		\$33.98
★ 7JP4	16.50	21EP4A	66.55
★ 10BP4A	16.70	10BP4A	13.00
★ 10FP4A	22.00	12LP4A	16.20
★ 12KP4A	25.00	14BP4A	13.50
★ 12LP4A	19.05	15DP4	20.50
★ 12UP4B	24.55	16FP4	22.60
★ 14CP4	18.75	16EP4A	22.60
★ 14EP4	16.75	16DP/HP4A	22.60
★ 16AP4A	26.45	16JP4A	22.60
★ 16DP4A	24.25	16LP4A	22.60
★ 16GP4	25.30	16KP4A	22.60
★ 16KP4/16RP4	22.98	17BP4	23.70
★ 17BP4A	21.75	19DP4	25.90
★ 17CP4	21.75	19AP4	25.90
★ 19AP4A	31.65	20CP4	28.00
★ 20CP4/20HP4A	32.25	21EP4	29.50
★ 20LP4	33.60	RAILAND	
		16EP4A	38.20

CHASSIS 630 REGAL with Cascade Tuner	\$139.50
Standard TV Tuners (similar to RCA)	2.98
OPEN FACE CABINET	39.00

## TRANSFORMERS

RCA type for 18" to 24"	\$3.85
G.E. type for 18" to 24"	3.85

These are very special prices while they last!

## DEFLECTION YOKES

COSINE FERRITE TODD YOKE 70"	\$4.20
------------------------------	--------

## SPECIALS

4 Prong Vibrators, each	\$1.29
Lots of 12 or more	1.19
12" Heavy Slug Speaker	Special 4.98

Audio Devices, Discs and Scotch Tape in Stock  
Audio Plastic Red Oxide Plastic Tape—  
Half-hour spool...\$2.30 One-hour spool...\$3.30

## WIRE RECORDERS IN STOCK

WILCOX GAY—Model 2A10	\$ 89.97
PENTRON—Model 9T3C—2 speed Tape Re- corder	Net 134.50

RADIO CRAFTSMAN	
Model RC2—Hi Fi Amplifier	Net 47.89
Model RC10—AM-FM Tuner	Net 130.84
Model CS—Williamson Amplifier	Net 99.45

Cascade Guaranteed Tuners (with tubes)  
SPECIAL! While they last...\$21.95

AUTHORIZED DISTRIBUTORS for: General Elec-  
tric, Kenrad, Tung-Sol, National Union, Jewel,  
De Wald, Regal, Automatic and Setchel Carlson.

We carry a complete line of popular makes of Radio  
and TV tubes, at 50% discount. Also many other  
special purpose and transmitting types, and all elec-  
tronic parts and equipment at lowest prices. Send us  
a list of your requirements for prompt quotations.

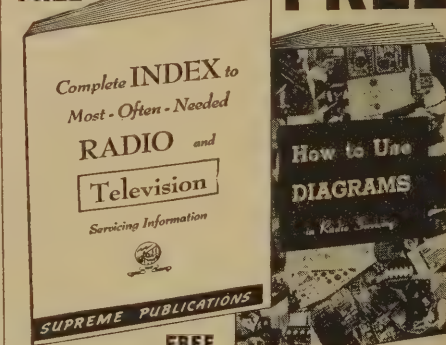
Terms: 20% with order. Balance COD. All prices  
FOB. NEW YORK Warehouse. Minimum order \$5.00.

Write for our latest price list to Dept. RE-1

**STAN-BURN** RADIO and  
ELECTRONICS CO.  
(C.E.S. THEATRE BLDG.)  
1697 BROADWAY • NEW YORK 19, N.Y.

BOTH BOOKS  
FREE

FREE



FREE to every reader of RADIO-ELECTRONICS. No  
strings, nothing to buy. "How to Use Diagrams" gives  
hints, suggestions, short cuts on the use of diagrams in radio  
servicing. The 25-page INDEX will tell you just what mod-  
els are included in all SUPREME "Most-Often-Needed"  
Radio or Television manuals. If you need a circuit at any  
time, this INDEX will tell you where to get it. Get both  
books in 2-in-1 volume FREE; just send stamp for postage.  
SUPREME PUBLICATIONS 3727 W. 13th St.  
Chicago 23, ILL.

PLEASE MENTION  
RADIO-ELECTRONICS  
when writing advertisers



A 300-ohm transmission line does not provide a good match to a rhombic which has an impedance of approximately 800 ohms. Connect a 490-ohm quarter-wavelength matching section between the antenna and lead-in. Use No. 12 wire spaced 2½ inches center-to-center or standard open-wire TV lead-in. The length of the matching section in inches equals 2,880 divided by the center frequency of the TV

channel in megacycles.

Since you are interested in reception on two channels, you should have a separate matching section and lead-in for each. Use 57 mc for channel 2 and 79 mc for channel 5 when calculating the lengths of the matching sections.

Use a d.p.d.t. antenna change-over relay at the antenna to connect the antenna to the matching section and lead-in being used.

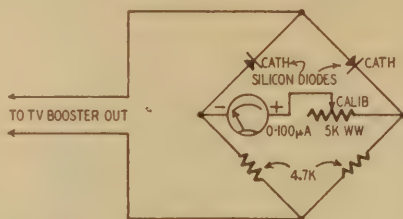
## FIELD-STRENGTH METER FOR TV MEASUREMENTS

? I would like to construct an inexpensive TV field-strength meter for use in antenna orientation and experiments. I have heard that one can be constructed from a TV booster or front-end. Please tell me how this is done.—L. McC., Schenectady, N. Y.

A. Such a meter usually resembles the video section of a TV receiver. The output of the tuner works into a conventional video i.f. strip. The output of the video detector is measured with a high-resistance voltmeter or the detector load current is read on a sensitive microammeter. A multiplier-resistor network is usually included to permit the unit to be used for a wide range of signal strengths. The i.f. strip is usually sharply tuned to the video carrier frequency for greater sensitivity. This calls for careful shielding and bypassing to prevent oscillations. Sensitivity may be controlled by varying the bias on one or more of the i.f. tubes.

The circuit of a tuned r.f. field-

strength meter is shown here through courtesy of Cornell-Dubilier Electric Corporation. The output of the booster feeds a full-wave bridge detector circuit consisting of two resistors and two silicon diodes. A 100-μa meter and a 5,000-ohm wire-wound potentiometer



are connected in series across the output of the bridge. The reading of the meter is proportional to the strength of the signal fed into the booster. The 5,000-ohm calibration control permits the meter to be set to a predetermined reference point. Silicon diodes are more efficient at TV frequencies than most germanium types.

## CONVERTING A G-E 260 PORTABLE FOR A.C. OPERATION

? I have a G-E model 260 portable receiver which I would like to convert for a.c. operation only. I want to retain the original tubes and eliminate the 2-volt storage battery. Please print a diagram of a suitable power supply and show how it can be connected to the receiver.—R. W. O., Minneapolis, Minn.

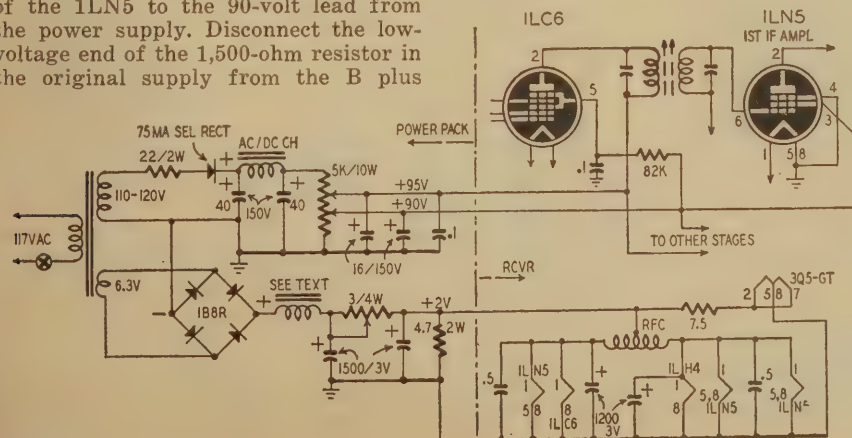
A. The diagram shows the circuit of an a.c. operated power supply (battery eliminator) and the method of connecting it to the receiver.

Disconnect the low-voltage end of the 10,000-ohm resistor in the original power supply from the lead going to pin 3 of the first i.f. amplifier and to the 82,000-ohm screen dropping resistor for the 1LC6. Connect the lead to pin 3 of the 1LN5 to the 90-volt lead from the power supply. Disconnect the low-voltage end of the 1,500-ohm resistor in the original supply from the B plus

line supplying the 3Q5, 1LH4, 1LN5 second i.f., 1LC6 plate, and 1LN5 r.f. amplifier. Connect this B plus line to the 95-volt point on the 5,000-ohm voltage divider in the supply.

Connect a 5.6-ohm resistor across the low-voltage (filament) supply output and adjust the 3-ohm resistor for exactly 2 volts output. Remove the 5.6-ohm resistor and connect the 2-volt lead to the tap on the r.f. choke.

The low-voltage choke is made by winding as many turns of No. 22 enameled wire as possible on the core of an old a.c.-d.c. filter choke. The rectifier may be a Mallory 1B8R or equivalent, and the power transformer is a half-wave type designed for use with selenium rectifiers.



L. Veltri, busy service-dealer of Westchester, N. Y., reports.

**I SAVED \$940\***  
by making a \$59 INVESTMENT  
in a Transvision  
**FIELD STRENGTH METER**

\* Says Mr. Veltri: "... The way I figure, in the last 6 months I saved that much money in installation time alone ..."



**FIELD STRENGTH METER**  
Saves 50% of Installation Cost  
Pays for itself on 3 or 4 jobs

**NO TV SET NEEDED**

Works from antenna ...

Measures actual picture signal strength directly from antenna. Shows antenna orientation maxima. Compares gain of antenna systems. Measures TVI on all channels. Checks receiver radiation (local oscillator). Permits one man antenna installation.



**PREVENT WASTE OF SERVICING TIME!** By checking antenna performance with the *Field Strength Meter*, the serviceman can determine whether the TV set or antenna, or both, are the source of trouble. Call backs are eliminated.



**Wide range:** Measures field strength from 10-50,000 microvolts. Has *Fringe Area Switch* for weak signal areas. 13 channel selector. Individually calibrated on every channel.

**ADAPTABLE for UHF**

Model **FSM-2**, for 110V AC only. Complete with tubes. Wt. 13 lbs. **net \$59.**

Model **FSM-3B**, for 110V AC and Battery Operation (all batteries and cables included). Wt. 22 lbs. **net \$79.**

**Order direct from factory:**

**TRANSVISION, INC., NEW ROCHELLE, N. Y.**

FREE: Sample copy of "TV and Electronics Notes". Or send 50¢ for year's subscription.



**10 DAY TRIAL**

Buy and try this fine instrument for 10 DAYS. Then, if you wish, you may return it. Your purchase price less 10% (our cost of handling and re-packaging) will be promptly refunded.

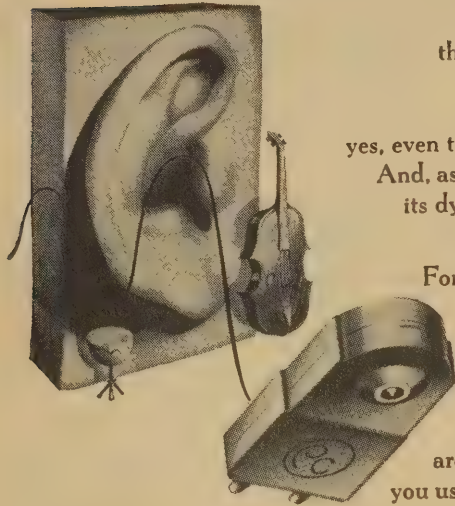
**TRANSVISION, INC., NEW ROCHELLE, N. Y.**

DEPT. RE-13F  
( ) Send me \_\_\_\_\_ Model FSM-2; \_\_\_\_\_ FSM-3B  
( ) Enclosed find \$\_\_\_\_\_ deposit. Balance C.O.D.  
( ) Enclosed find \$\_\_\_\_\_ in full. Send prepaid.  
I accept your 10 Day Trial terms.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



*"For those who can hear the difference"*  
*Listen....*



it comes to you  
 in the subtle shading of a piano...  
 in the clean brilliance of violins,  
 the purity of a flute. Your ear detects  
 the sweet mellowness of cellos,  
 the roundness of a clarinet...  
 yes, even the iridescence of clashing cymbals.  
 And, as the symphony swells to crescendo,  
 its dynamic energy adds a flood of color  
 to your musical canvas.

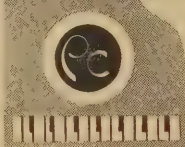
For those who can hear the difference,  
 these are the elusive pleasures  
 that often remain hidden  
 in the grooves of fine recordings.

These are the thrilling  
 new listening experiences that  
 are released for your enjoyment when  
 you use quality components by Pickering.

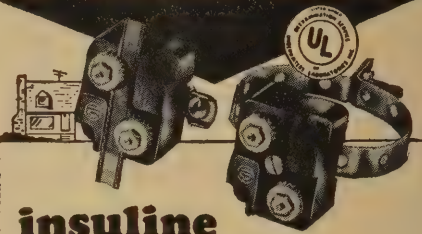
## PICKERING and company, incorporated

Pickering High Fidelity Components are  
 available through leading Radio Parts dis-  
 tributors everywhere; detailed literature  
 sent upon request.

Oceanside, L. I., New York



**Scientifically engineered  
 for MAXIMUM SAFETY!**



**insuline**

## TELEVISION LIGHTNING ARRESTERS

Fastest selling lightning arresters in the  
 country. Precision made to assure maximum  
 protection. Supplied with sure-grip binding  
 washers to eliminate necessity of stripping  
 insulation.

Model 6113—Attach to any conven-  
 ient base. Can be used indoors, too.

List \$1.25

Model 6114—Includes metal strap  
 for securing to metal pipes of 1/2" to 2 1/2" diameter.

List \$1.50



Write Dept. RE-1  
 for Latest Catalog.

**insuline**

CORPORATION OF AMERICA

INSULINE BUILDING • 36-02 35th AVENUE  
 LONG ISLAND CITY, N. Y.

West Coast Branch and Warehouse:  
 1335 South Flower Street, Los Angeles, Calif.  
 Exclusive Canadian Sales Agents:  
 CANADIAN MARCONI COMPANY, Toronto

**Creating \$ALES for YOU  
 with Consumer  
 Advertising!**

with  
**Television Spots**  
 Throughout  
 the country

**\$9.95**  
 LIST  
 PRICE

\*U. S. Patent No. 2,495,579  
 Canadian patents 1981

Available at leading jobbers!

with  
**TV Consumer  
 Magazine Ads**  
 Throughout the country

**The Genuine  
 HI-LO TV  
 Spiral-Tenna**  
 Model 101 (indoor)

**Hi-Lo TV ANTENNA CORP.**  
 3540 N. Ravenswood • Chicago 13, Illinois

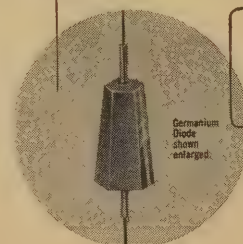
## Flying Saucers?

Frankly we don't know if they're fact or fiction... but if they  
 are fact it wouldn't surprise us a bit to learn that some extra-  
 terrestrial manufacturer has incorporated SELETRON Selenium  
 Rectifiers and R. R. Co. Germanium Diodes into the design.

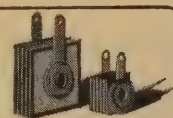
That's because—as pioneers in the field of electronic develop-  
 ment—we've had our hand in some of the most difficult projects  
 and met some of the stiffest requirements ever cooked up! Mak-  
 ing drawing board dreams come true are daily chores at Radio  
 Receptor Co.!

### GERMANIUM DIODES

Radio Receptor's new Germanium Diodes feature polarity  
 at a glance combined with simplicity of construction  
 and sound design principles. The tapered shape speeds  
 assembly because operators can see at a glance  
 the correct direction of assembly. Users are enthusiastic  
 over the quality of the product which is currently  
 being used in walkie-talkies, computers, TV sets,  
 tuners and other electronic applications.



Germanium  
 Diode  
 shown  
 enlarged



### SELENIUM RECTIFIERS

Seletron Selenium Rectifiers,  
 in both miniature and  
 industrial types, are in  
 constant demand by an increasingly  
 large number of engineers through-  
 out the world because they are  
 completely dependable under the  
 most grueling conditions.  
 Years of experience have given  
 Radio Receptor Co. a deep insight  
 into the idiosyncrasies of  
 rectification.

Our Germanium Diodes and Seletron Selenium Rectifiers  
 may hold the answer to many of your problems. Radio  
 Receptor Engineers will be glad to study your require-  
 ments and submit their recommendations on both of  
 these products.

Germanium Transistors available in limited quantities.

Seletron  
 and Germanium  
 Division

**RADIO RECEPTOR COMPANY, Inc.**

Since 1922 in Radio and Electronics  
 SALES DEPT: 251 West 19th Street, New York 11, N. Y. • FACTORY: 84 North 9th Street, Brooklyn 11, N. Y.

RADIO-ELECTRONICS



## ADMIRAL AM-FM TUNERS

Oscillations which cause motorboating or whistles in the center of the AM band when the loop antenna is used are the result of excessive regeneration in the converter stage of the 4J1 and 4K1 chassis. The AM peaking coil L606 (between pin 6 of the 12AT7 and the plate lead of the first AM i.f. transformer) is used to provide positive feedback in the converter stage. This eliminates grid loading, inherent with a triode mixer, and provides greater conversion gain. If the resistor shunting the peaking coil increases beyond its specified tolerance, the set will oscillate in the middle of the band.

To verify this as the cause of the trouble, place your hand across the loop antenna. If oscillations stop, replace the damping resistor and the peaking coil—a 475- $\mu$ h unit coded with a blue dot—with a new 120- $\mu$ h coil (part No. 73A5-10) coded with a black dot.

If oscillations are present when the new peaking coil is used, look for trouble in the first AM i.f. transformer. In some cases, the silver mica capacitors in the transformer open up and cause the converter to oscillate. Replace the transformer.—*Admiral Service Bulletin*

## BUZZ IN SENTINEL SETS

If station buzz is excessive and is not caused by the contrast control being advanced too far clockwise, adjust the discriminator secondary tuning slug for minimum buzz. Make sure that this position is between two maximum buzz peaks which will be noticed when the tuning slug is turned to the right and to the left of the minimum buzz position.

This adjustment screw is located on top of the discriminator coil shield and between the 6AL5 sound detector tube and the 6AU6 sound i.f. amplifier tube.—*Sentinel Service Notes*

## MOTOROLA TS-174 CHASSIS

A vertical roll which cannot be stopped with the hold control may be caused by a change in the value of the fixed resistor in series with the vertical hold control. In one case, the value of the resistor had increased from 220,000 to 320,000 ohms.—*Stephen A. Quering*

(The vertical oscillator circuit varies with different production runs and versions of the chassis. In sets which use a 6J5-GT blocking-tube oscillator, the series resistance is 220,000 ohms. If the sweep generator is a 12AU7 multivibrator, the series resistance should be 330,000 ohms. When checking voltages and component values, be sure to refer to the manufacturer's service data and notes on production changes.—*Editor*)

## RCA TV RECEIVERS

A light 2-3-inch horizontal band which drifts slowly across the face of the picture tube may be caused by oscillations in the 6BQ7 r.f. tube in the 17T150, 17T160, 17T170 (chassis KCS66) and 21T160 (chassis KCS68) models. In most cases, this trouble can be cured by replacing the tube.—*Gerald J. Macheak*

STANDARD BRANDS  
STANDARD WARRANTY

**TUBES**  
New Low Prices

INDIVIDUALLY BOXED  
BRAND NEW!!

0Z4 ... \$ .54	5Y3G ... \$ .39	6BA6 ... \$ .54	6F6GT ... \$ .54	6W4GT ... \$ .54	12SQ7GT \$ .63
1B3GT ... .87	6AB4 ... .61	6BA7 ... .76	6H6 ... .57	6W6GT ... .65	19BG6G ... 1.75
1L4 ... .65	6AC7 ... .98	6BC5 ... .65	6J5GT ... .54	6X4 ... .49	19T8 ... .87
1R5 ... .65	6AG5 ... .64	6BE6 ... .57	6J6 ... .76	6X5GT ... .43	25AV5GT 1.05
1S4 ... .76	6AG7 ... 1.05	6BF5 ... .69	6K6GT ... .54	12AT6 ... .47	25BQ6GT 1.08
1S5 ... .64	6AH6 ... 1.05	6BG6G ... 1.86	6L6GA ... 1.05	12AT7 ... .76	25L6GT ... .54
1T4 ... .64	6AK5 ... .94	6BH6 ... .72	6SA7GT ... .61	12AU6 ... .54	25Z6GT ... .49
1U4 ... .69	6AL5 ... .54	6BJ6 ... .61	6SC7 ... .76	12AU7 ... .65	35B5 ... .61
1U5 ... .61	6AQ5 ... .54	6BL7 ... .98	6SF5 ... .58	12AV7 ... .88	35C5 ... .61
1X2A ... .79	6AQ6 ... .49	6BN6 ... .72	6SH7 ... .65	12BA6 ... .54	35L6GT ... .61
3Q4 ... .75	6AR5 ... .54	6BQ6 ... 1.08	6SJ7 ... .54	12BE6 ... .58	35W4 ... .41
3Q5GT ... .72	6AS5 ... .62	6BQ7 ... 1.08	6SL7GT ... .64	12BH7 ... .82	35Z5GT ... .39
3S4 ... .65	6AT6 ... .46	6C4 ... .49	6SN7GT ... .73	12SA7GT ... .62	50B5 ... .61
3V4 ... .65	6AU6 ... .54	6C5 ... .57	6SQ7GT ... .49	12SG7 ... .61	50C5 ... .61
5T4 ... 1.31	6AV5GT ... 1.09	6CB6 ... .65	6SR7 ... .49	12SH7 ... .49	50L6GT ... .59
5U4G ... .54	6AV6 ... .46	6CD6G ... 1.82	6T8 ... .87	12SK7GT ... .63	117Z3 ... .54
5V4G ... .98	6B4G ... .98	6E5 ... .76	6V6GT ... .57	12SN7GT ... .73	

Many other types equally low priced—include all your tube needs with your order.

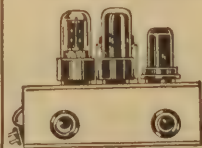
One of the largest stocks in the country!

Min. Order \$25.00. Terms: 25% with order, balance C.O.D.

All prices subject to change without notice. F.O.B. New York City. Mail order division.

**TeleVision Materials Corp.**  
120 LIBERTY ST., NEW YORK 6, N.Y. • COntlandt 7-4307

## AC-DC MUSIC AMPLIFIER



Volume and tone control.  
1.5 w. output.

See your jobber.

MICHEL MFG. CO.  
227 N Water St.  
Milwaukee 2, Wis.

## THE NEW

**Sky Hi**

## HYDRAULIC MAST

Now you can have the SKY-HI mast in steel or aluminum with latches or without, in any height up to and including 200 feet.

Your choice of hand pump, 110 volt or 6 volt electric driven pump, or in many cases available water pressure is sufficient for operating the aluminum mast.

Also complete trailer and mast assembly up to 100 feet for survey work ready to put into service.

These products are approved and used by many government and commercial agencies.

We welcome comparison with any other mast built when you are considering speed of erection and lowering, and all around versatility.

Write for details.

**THOMAS MOLD & DIE CO.**

WOOSTER, OHIO

**FREE**

Write today for "How to Service T.V. Receivers" with the HICKOK VIDEO GENERATOR.

Hickok Electrical Instrument Co.  
10814 Dupont Ave., Cleveland, Ohio

GET INTO ONE OF THESE  
GREATER OPPORTUNITY FIELDS

**Electricity or  
Radio-  
Television**

TRAIN IN THE GREAT SHOPS OF  
**COYNE** OLDEST, BEST EQUIPPED  
SCHOOL OF ITS KIND IN U.S.

Come to the Great shops of Coyne in Chicago. Get practical training in TELEVISION—RADIO—ELECTRICITY—ELECTRONICS—vital in Defense Program. Prepare now for a better job in Industry or higher rating in Armed Forces.

**Approved for Veterans**—finance plan—enroll now, pay most of tuition later. Part time employment service while training if needed. Special tuition plan for men of Draft Age.

**FREE BOOK** Clip coupon for Big Free Illustrated Book. No obligation. No salesman will call. Act NOW.

B. W. Cooke, President

**COYNE** A TECHNICAL TRADE  
INSTITUTE CHARTERED  
NOT FOR PROFIT  
Established 1899  
500 S. Paulina, Chicago

ELECTRICITY ★ TELEVISION  
RADIO ★ REFRIGERATION ★ ELECTRONICS

B. W. COOKE, Pres.  
COYNE School  
500 S. Paulina St., Chicago 12, Ill. Dept. 92-81H  
Send FREE BOOK and details on:

☐ RADIO-TELEVISION ☐ ELECTRICITY

NAME.....

ADDRESS.....

CITY.....STATE.....





# DON'T BUY BEFORE CHECKING STEVE-EL'S PRICES!

## NEW IMPROVED 1953 630 TV CHASSIS

now only **\$146<sup>50</sup>**

**FEATURES:** Manufacturer licensed under RCA patents • 30 tube TV receiver (including 3 rectifiers) • FREE replacement on defective tubes and parts • Full channel coverage • Discriminator-type FM sound system • Improved picture brilliance • AFC horizontal hold • Keyed AGC • Stabilized vertical hold • 3 stage sync. separator and clipper • Automatic brightness control • 4 Mc band width • Highest quality parts used. All standard tubes • For all Cathode Ray tube sizes and types. 16", 17", 19", 20" and 24" Tubes. Perfect for Fringe Area Reception.—Will work where most sets fail to operate.

With Hi Gain CASCODE Tuner, RCA Hi-Fi 12" Speaker, all knobs and hwre. .... **\$146<sup>50</sup>**

630 DF Chassis—Extra power for fringe areas. No need for booster or complicated antenna. .... **\$161<sup>50</sup>**

Cathode Ray chassis mounting brackets for above. .... **\$4.95**

## SPECIAL TUBE SALE!

FULLY GUARANTEED—INDIVIDUALLY BOXED tubes at sensational low prices. Stock up now! Quantities limited!

1B3GT .63	6BQ6 .76	6V6GT .46	12SL7 .57
1U4 .48	6BQ7 .86	6V8 .83	12SN7 .54
1U5 .48	6CB6 .48	6W4 .44	12SQ7 .42
1X2 .68	6F6GT .49	6W6 .52	19T8 .64
5W4GT .46	6J6 .79	6X4 .34	25B6 .77
5Y3GT .29	6L6G .89	7X7 .62	25W4 .48
6A7 .62	6SA7 .52	12AT6 .48	25L6 .48
6AG5 .59	6SG7GT .49	12AU6 .48	25Z6 .42
6AK5 .14	6SK7 .49	12AU7 .56	35C5 .57
6BC5 .58	6SL7 .52	12AV6 .52	35L6 .48
6BE6 .48	6SN7 .54	12AZ7 .94	35Z5 .33
6B6 .121	6SQ7 .42	12BA6 .47	50L6 .48
6BH6 .62	6T8 .74	12SA7 .52	80 .38
6BJ6 .53	6U6 .57	12SK7 .49	

## TV PICTURE TUBES

10BP4 ...\$17.95	16GP4 ...\$26.00	19AP4 ...\$31.40
12LP4 ...19.95	16HP4 ...19.95	20CP4 ...32.00
14BP4 ...19.95	16KP4 ...23.40	21EP4 ...34.40
16AP4 ...26.40	17BP4 ...23.40	24AP4 ...59.60

All brand new—standard brands

**GUARANTEED FOR ONE  
FULL YEAR!**

## TAPE RECORDERS

Weber 210 .....	\$144.50
Pentron 9T3C .....	117.50
Tape Master PT-125 Recording Unit .....	89.50
SA-13 Power Amplifier and Speaker .....	69.50

**FREE! FREE!**

Write for latest catalog of  
hundreds of "rock bottom" values!

**STEVE-EL ELECTRONICS CORP.**

VISIT OUR  
NEW STORE

Dept. **E-1** 61 Reade St., New York 7, N. Y. COrtlandt 7-0086

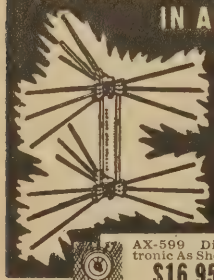
## GIANT BARGAINS

BECAUSE  
WE'RE

**SPECIALISTS in TV ANTENNAS**  
ACCESSORIES, EQUIPMENT FOR ALL LOCATIONS

AMAZING NEW MOTORLESS  
TV ANTENNA

### All Channel TV RECEPTION IN ALL DIRECTIONS



**Rocket Directronic  
MOTORLESS  
TV ANTENNA**

**360° Electrically  
Switched Beam**

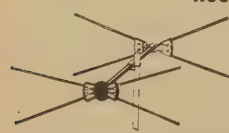
No Motors  
No Roof Orientation

No Electric Power  
No Ghosts  
Flick of Switch Clears  
Picture Instantly

**\$16.95**

**BEAM SELECTOR**—Provides same clear pictures as rotating aerials costing 4 times as much. Electronically beams in all directions with full 360° rotation. You select direction with Directronic Beam Selector located at set. Model AX-599 stacked array includes 18 hi-tensile aluminum elements, 1 set connecting stubs, Universal U-Clamps for mast, Directronic Beam Switch, and 75-feet of Tri-X lead in. Model AX-59 Directronic 9-element Single. ....\$10.35

### Rocket ALL CHANNEL CONICALS



This sturdy, all-aluminum constructed TV antenna is designed for broad-band reception on all TV channels plus FM. High Gain, 4 to 1 front to back ratio. All channels 2-13. Uni Directional. Maximum signal inception angle. Complete with all hardware—less mast.

Single Bay Array. ....\$3.95  
2 Bay Array with Tie Rods. ....\$8.65  
Fringe Area 4 Bay Array including 4 Bay Stacking Bars. ....\$18.95

**FREE**  
of extra  
cost

With each order of \$10 or more—air mail, special delivery, registered—you will receive our Rocket 7 Ft. Interlock Line Cord. Permits adjustment, testing, repair of set while operating with back removed. When ordering, state that you want this gift. Don't delay as quantities are limited. Only one given to a customer.

### ROCKET 5 ELEMENT YAGI

Excellent Pictures in Fringe Areas

Designed for high gain with minimum interference from ghosts and noise due to directive pattern. Produces clear sharp pictures. 5 Heavy aluminum elements include one folded dipole, one reflector, three directors. Strong molded insulator. Non-slip mast clamp. Completely pre-assembled, less mast.

Channels 7 through 13 ..... **\$3.95**  
Channels 5 or 6 ..... **\$6.95**  
Channels 2, 3, or 4 ..... **\$7.95**  
When ordering, specify exact channel number desired.

### Rocket 35-foot Mast Kit

Economy mast kit contains 3-10' seamless dualcoated 1 1/4" OD masts, one 5' mast, 300 feet of 6/20 galvanized steel guy wire, and everything else needed including guy rings, mast connectors, insulators, cable clamps, guy hooks, and swivel mounting base.

35 Foot Mast Kit **\$15.95** 25 Foot Mast Kit **\$11.95**

### LOWEST PRICES ON ANTENNA ACCESSORIES

Mast Steel (Dualcoated 5' crimped) 1 1/4" O. D. ....	\$1.05
Mast Steel (Dualcoated 10') 1 1/4" O. D. ....	\$1.95
Mast Connectors for 1 1/4" O. D. Mast ....	.59
Chimney Mount Complete with Straps ....	\$1.19
Peak Roof Saddle (will take up to 1 1/2" O. D.) ....	\$1.59
Lightning Arrestor-TV ....	.69
Galvanized Steel Guy Wire-6/20 ....	34¢ ft.
Galvanized Steel Guy Wire-11/20 ....	13¢ ft.
Rocket Twin-Lead-7/28 stranded ....	2¢ ft.
UHF-type Tubular 300 ohm Twin-Lead (100' coil) ....	\$4.95
Rocket Twin-Lead-7/28 stranded ....	
Rocket Open Line Twin-Lead (500' reel) ....	\$20.95
Mast Stand-off Insulators-3" ....	.10
Stand-off Screw Insulators-3" ....	.03
Wall Bracket-6" clearance ....	\$1.49
Wall Bracket-12" clearance ....	\$2.49

**ALL PRICES F.O.B. CLEVELAND, OHIO**  
Do not remit more than complete purchase price. Pay shipping charges on receipt of goods. 25% deposit on all C.O.D. orders, please. Money-back guarantee. Prices Subject to Change Without Notice

**National Electronics**  
OF CLEVELAND  
**THE HOUSE OF TV VALUES**  
213 Delco Building, Cleveland, Ohio

now **2** specific type  
**FLYBACKS** by  
**HALLDORSON**  
service

**115** DIFFERENT  
ADMIRAL  
TV MODELS



**ECONOMY**—With Halldorson FB405 and FB406 Flybacks you utilize costly Ferrite pieces and mounting brackets of Admiral part being replaced.

**CONVENIENCE**—Both units are completely wired to terminal boards with exact

length plate leads and clips attached. New H. V. filament wires and easy assembly instructions supplied.

Think of it! Two parts that are not makeshift arrangements but specific replacements for 115 popular TV models made during the last two years by Admiral. You get them as complete coil assembly replacements ready for quick installation. Keep a few FB405's and FB406's on hand for quick service and extra profits! See your distributor today.

**HALLDORSON TRANSFORMER COMPANY**  
4500 N. Ravenswood Ave. Chicago 40, Illinois  
Write Dept. RE-1



**HALLDORSON**  
QUALITY Transformers SINCE 1913

EXPORT: Intex Co., Inc., 136 Liberty St., New York 6, N.Y. Cable Address: Intexcom, N.Y.

RADIO-ELECTRONICS



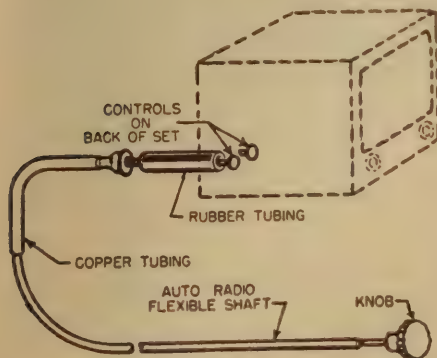
## TV ANTENNA PRECAUTIONS

Always disconnect a TV or FM receiver from the line by pulling the plug before making any adjustments on the outside antenna. If the set must be turned on while orienting the antenna, be sure that you wear heavy gloves and that you do not permit any exposed part of the body to contact the antenna or mast. Failure to observe these precautions may cause serious injury. Don't rely on the switch. Pull the plug!

I have been shocked several times while reinstalling or orienting TV antennas. In most instances, the shock came when I touched the radiator connected to the lead-in. I don't believe that I got the full line voltage, but it was strong enough to be uncomfortable. In another case, I received a severe shock when I touched the mast while standing on a metal ladder. This time, the shock could have caused me to lose my balance and fall to the ground. Now, I pull the plug whenever possible and I wear heavy work gloves during antenna orientation.—*Alexander Kauders*

## TV SERVICING TOOL

The gadget shown in the illustration is handy for adjusting the rear controls on large TV cabinets while watching the picture from the front. The tool is made from an auto radio flexible con-



trol shaft, a length of copper tubing, and a short piece of windshield-wiper hose. The copper tubing controls the degree of bend to prevent whipping and binding. The rubber hose slips over the shaft of the control to be adjusted.—*Motorola Service and Installation Bulletin*

## CORONA TROUBLES

The cheaper fiberboard type high-voltage insulation materials tend to absorb moisture in coastal areas where humidity is high. This causes loss of high voltage and severe corona troubles. In one 16-inch set, a faint blue was observed all over the insulation and high-voltage leads when a blanket was thrown over the high-voltage cage to darken it. The condition was cleared up by replacing the fiberboard with plastic and the socket with a porcelain type.

Severe corona will often cause a horizontal output tube to fail within a few weeks. Metal shielding which is too close to the plate cap of the output tube will show a polished or bright circle opposite the cap if corona exists at this point.

JANUARY, 1953

## AMERICA'S FASTEST GROWING TV ANTENNA MANUFACTURER DAVIS ELECTRONICS

## THERE MUST BE A REASON

THE REASON IS: The DAVIS SUPER-VISION is the finest antenna built for V.H.F. ALL CHANNEL and for FRINGE AREA and DX RECEPTION... A steady flow of enthusiastic letters from users all over the U.S. attests to this fact—and is outstanding proof of its UNIVERSAL ACCEPTABILITY.



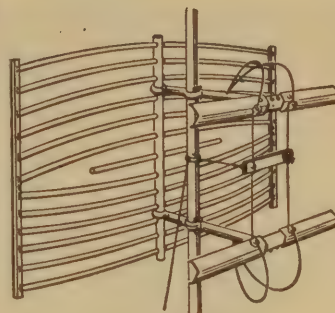
HAVING TROUBLE  
GETTING FAR AWAY  
TELEVISION STATIONS  
UP TO 125 MILES  
AWAY—OR MORE?

1. EXCELLENT FOR FRINGE AREA and DX RECEIVING—and broad band receiving with high gain on all channels—2 through 13.
2. CLEARER PICTURES UP TO 125 MILES OR MORE—from the station.
3. GHOST PROBLEMS REDUCED or eliminated due to excellent pattern.
4. PROVIDES 10 DB OR MORE GAIN ON HIGH CHANNELS where gain is needed most.
5. EXCELLENT FRONT TO BACK RATIO on all channels. No co-channel interference.
6. MINIMIZES INTERFERENCE: Airplane Flutter—Diathermy and Ignition—F.M.—Neon Signs—X-Ray—Industrial—Etc.
7. ELIMINATES DOUBLE STACKED ARRAYS, and out-performs 2 bay yagis on low band and 4 bay yagis on high channels.

## DAVIS ELECTRONICS

4313 WEST MAGNOLIA BLVD.  
BURBANK, CALIFORNIA

Manufacturers of V.H.F. and U.H.F. Antennas  
Backed by Over a Quarter Century of  
Electronic Experience



## DAVIS SUPER-VISION

"THE ORIGINAL ANTENNA SOLD  
WITH A MONEY-BACK GUARANTEE"

ADVANTAGES OF THE DAVIS SUPER-VISION  
WITH ELECTRONIC DIPOLE SEPARATORS:

8. ONLY ONE TRANSMISSION LINE NECESSARY.
9. NO WORRY OVER POSSIBLE CHANNEL CHANGES on either high or low channels.
10. CAN BE TIPPED WITHOUT TILTING MAST to take advantage of horizontal wave lengths.
11. Can be used with ANTENNA ROTOR

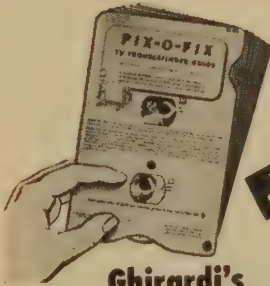
AT YOUR JOBBERS, OR WRITE TO:

DAVIS ELECTRONICS	1-24
4313 West Magnolia Blvd., Burbank, California	
SIRS: RUSH INFORMATION TO ME AS CHECKED BELOW:	
<input type="checkbox"/> Send Free Technical Data on new SUPER-VISION ANTENNA.	
<input type="checkbox"/> Send Name and Address of NEAREST JOBBER.	
Name _____	
Street _____	
City _____	State _____

Spot TV trouble symptoms at a glance  
... fix them twice as fast!

## NOW! SAVE HUNDREDS OF DOLLARS IN TV SERVICING TIME!

The short cut way of handling up to  
90% of your television troubleshooting by  
the easy PICTURE ANALYSIS METHOD!



Ghirardi's  
**PIX-O-FIX**

TV TROUBLE  
FINDER GUIDE

24 COMMON television troubles identified by actual TV screen photos.

190 POSSIBLE causes of these troubles identified and localized to the particular stage of the receiver where they are most likely to occur.

253 DEFINITE, easily understood remedies for these troubles.

4,500 WORDS in CAUSE and REMEDY section to explain step by step what to do.

Just Out!

Hours of tedious, time-consuming troubleshooting can be cut to minutes. Repairs can be made twice as fast! Just "dial" the new Ghirardi's PIX-O-FIX TV TROUBLEFINDER GUIDE until the actual TV screen photo appearing in its "window" matches the screen picture on the defective set you are repairing. The proper Trouble Key Number also appears on the guide. This directs you to the tabulation giving all possible causes of this particular trouble and the stage or section of the receiver in which

it is most likely to occur. But this is only the beginning!

The Pix-O-Fix Guide not only helps you locate the trouble quickly but then shows you exactly how to fix it. Step-by-step repair instructions follow. In most cases, the particular component most likely to be faulty is specified. Quick tests to apply to it are explained. If part substitution is likely to be more effective than an instrument test, this is recommended.

PIX-O-FIX is applicable to all television receivers. Operation is clear and simple. Money-back guarantee if you're not more than satisfied!

NOTE!

Ghirardi's PIX-O-FIX is designed and sold as a professional TV service device for servicemen—NOT as a "fix-it-yourself" gadget for use by consumers.

Only \$1.

10 DAY Money back Guarantee

Dept. RE-13, Rinehart Books, Inc., Technical Div.  
232 Madison Ave., New York 16, N. Y.

Enclosed is \$1 for which please rush a PIX-O-FIX TROUBLE FINDER GUIDE. If not satisfactory, I will return it postpaid within 10 days and you guarantee to refund my \$1.

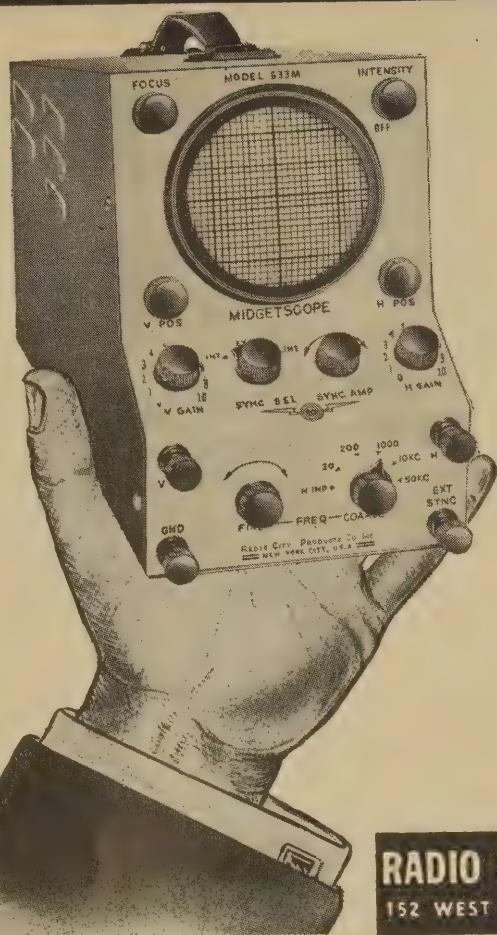
Name \_\_\_\_\_

Street \_\_\_\_\_

City, Zone, State \_\_\_\_\_

PRICE OUTSIDE U. S. A. \$1.25 cash—same return privilege.





# RCP leads the field again ... with the finest ... MIDGETSCOPE

MODEL 533M

**WEIGHS ONLY 9 LBS.!**

**SIZE: 11 $\frac{3}{4}$ " x 7 $\frac{3}{4}$ " x 5 $\frac{1}{8}$ "**

**THE MIGHTY MIDGET**—Here is a truly miniaturized professional oscilloscope for convenience of operation without loss of performance. A new concept in electronic oscilloscopes.

**CHECK THIS PERFORMANCE!**

**SENSITIVITY:** Vertical—20 millivolts (.020 volts for 1" rms deflection on CRT face.) Horizontal—.6 volts.

**FREQUENCY RESPONSE:** 2 db from 20 cycles to 180 kilocycles. Excellent Transient Response.

**PUSH-PULL DEFLECTION:** For undistorted Response—Eliminates Parallax. Full Vertical and Horizontal Expansion of Trace.

**INPUT IMPEDANCE:** Vertical—.5 megohms shunted by 70 MMF. Horizontal—.5 megohms shunted by 70 MMF.

**TUBE COMPLEMENT:** 12AT7, 12AU7, 12AX7, 6J6, 117Z6, 3MPI CRT.

In metal case with leather handle—Etched panel  
—Smart brushed aluminum face—Fuse protected  
—for 105-125 volt, 60 cycle AC operation.

MODEL 533M—**\$99.<sup>50</sup>**  
Complete, ready  
to operate **NET**

Write for the new RCP catalog to Dept. RE-1

**RADIO CITY PRODUCTS CO., INC.**

152 WEST 25th ST. • NEW YORK 1, N. Y.



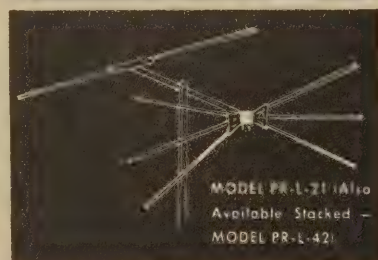
a "TESCO" exclusive  
the **ROCKETENNA**

by T-V PRODUCTS CO.



- ✓ Amazingly Powerful Reception
- ✓ Rugged All-Aluminum Construction
- ✓ Lifetime Factory Warranty

Complete factory Preassembly features sensational "Quick-as-a-Wink" construction. No Nuts or Bolts to Tighten... rugged rivet assembly prevents damage by wind and storm vibration.



ANOTHER "TESCO" PRODUCT

**T-V**

Write for New Complete Catalog P

**PRODUCTS CO.**

152 SANDFORD ST. • B'KLYN, N. Y.



Choice of 3 Time Saving

## OHMITE Famous "Little Devil" RESISTOR ASSORTMENTS

**FREE  
PLASTIC  
CABINET**

For The  
Price Of  
Resistors Alone



The 1/2 watt assortment contains 150 carefully selected Ohmite "Little Devil" individually marked, insulated composition resistors. 1 and 2 watt assortments each contain 125 resistors. All assortments include the 40 values (10 ohms to 10 megohms) most frequently used by servicemen. All plastic cabinet has five drawers, each with 8 individually labeled compartments. Offered at the price of the resistors alone.

1/2 watt  
assortment **\$15.00**  
1 watt  
assortment **\$18.75**  
2 watt  
assortment **\$25.00**

Address Orders To Dept. RE 1  
Write For Free FY 1 FLYER

**WHOLESALE  
RADIO PARTS CO., Inc.**  
311 W. Baltimore St.  
**BALTIMORE 1, MD.**



## ENGINEERS

*Make this your home for important work under ideal conditions*

- TV Receiver Design Eng.
- Test & Inspection Eng.
- Electronics Eng.
- Field Engineers
- Lab Technicians

## TO WORK ON:

Radar, G. C. A., Mobile Radio, Auto Radio, Airborne Communication & Navigation Equipment, Television, Antennas, Microwave Equipment, Servo Mechanisms, Guided Missiles and Test Equipment.

## YOU BENEFIT

from high wages, a modern, air-conditioned plant, paid vacations and holidays, group insurance and a good chance for advancement. Housing immediately available in the beautiful suburban and country areas that surround the Bendix plant.

Write Wire, Phone Mr. E. O. Cole, Dept. S

**Bendix Radio**

DIVISION OF BENDIX AVIATION CORP.  
BALTIMORE-4, MD. Phone: TOWSON 2200

## KNOW TUBES—

and you'll know radio

**RADIO TUBE FUNDAMENTALS**—Gernsback Library Book No. 45. 96 Pages. \$1.00

Tubes are the heart of radio, yet how many technicians really understand the theory behind them? Here's a book that lifts the cloud with a minimum of math—and no engineering talk. It's a real gem at this price.

(Available at leading parts distributors)

**GERNSBACK PUBLICATIONS, INC.**

Publishers of RADIO-ELECTRONICS  
25 West Broadway New York 7, N. Y.

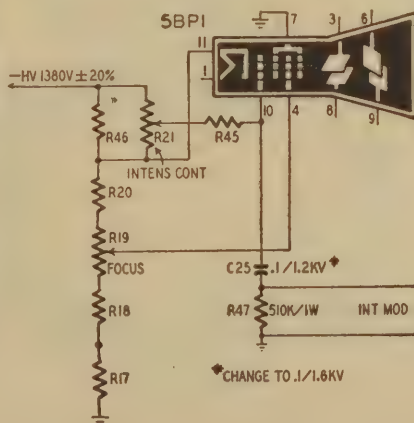
## STROMBERG-CARLSON 421 SERIES

Repeated failure of the 6BL7-GT vertical oscillator and output tube (V18) in the 421 series chassis has been corrected in all chassis dated 52-20-1 by substituting a 6C4 for the vertical oscillator section of the 6BL7. A 6C4 tube was installed in an unused socket hole in the left front corner of the chassis. Grid, plate, and cathode leads (pins 4, 5, and 6) were disconnected from the 6BL7-GT (V18) and connected to pins 6, 5, and 7, respectively, of the 6C4. Pins 3 and 4 of the 6C4 were connected to the filament line and the unused pins (4, 5, and 6) of the 6BL7 were grounded.

If an earlier 421 receiver with a 6BL7 that causes vertical roll and which does not incorporate the 6C4 is encountered, it is suggested that the 6BL7 be replaced by one of the improved types. These can be identified by referring to the coding etched into the envelope beneath the 6BL7 tube designation. All Sylvania 6BL7-GT's are now of this improved version, so tubes coded E2E or later (F2E, G2E, H2E, etc.) are satisfactory replacements. If desired, the changeover to a 6C4 described in the first paragraph, can be made.—Stromberg-Carlson Current Flashes

## EICO 425K OSCILLOSCOPE

Improper operation of the intensity control—indicated by excessive brightness at minimum setting—is usually caused by heavy leakage in capacitor C25 in the intensity modulation input circuit. The original capacitor is a 0.25- $\mu$ f unit, rated at between 1,000 and 1,200 volts. However, the normal voltage at grid 1 of the 5BP1 is 1,380 volts  $\pm$  20%. This capacitor may check good under normal resistance checks but its

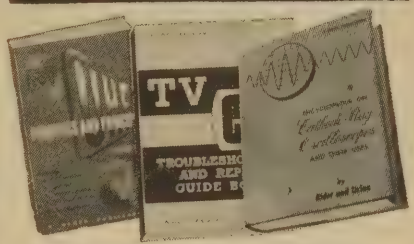


resistance drops when voltage is applied. This places an excessive drain on the high-voltage supply and causes a high negative voltage to appear across the INT MOD terminals.

Replace this capacitor with a unit rated at 1,600 volts or more, even if it has not shown the symptoms of leakage or breakdown. If it breaks down in use, operator may get a severe shock or equipment connected to the INT MOD terminals may be damaged.—G. P. Oberto

END

## RIDER BOOK SHELF



## 1 ENCYCLOPEDIA ON CATHODE-RAY OSCILLOSCOPES AND THEIR USES

by Rider and Usian

The most complete source of practical, usable knowledge concerning the oscilloscope ever published. Covers practically every kind of 'scope manufactured during the past ten years. Hundreds of pages alone are devoted to actual application plus complete, detailed treatments of auxiliary equipment, measurements, waveforms, visual alignment of AM-FM-TV receivers and more, much more. A "must" for anyone using an oscilloscope. Completely indexed, with 992 pages (8½ x 11") 3,000 illustrations .....\$9.00

## 2 TV TROUBLESHOOTING AND REPAIR GUIDE BOOK

by R. G. Middleton

A new practical book designed to make your tv servicing easy. It tells—in easy-to-read language—how to spot receiver troubles... and how to correct them permanently. You'll find enough practical data in one chapter to repay the low cost of this book many times over. Typical chapters include: Receiver Differences and Waveforms; Visual Alignment; Troubleshooting Sync Circuits; Locating Sweep Troubles; Causes and Cures of Receiver Buzz; Test Equipment Kinks. Indexed and illustrated with over 190 (8½ x 11") pages bound in durable art cover .....\$3.90

## 3 UHF PRACTICES AND PRINCIPLES

by A. Lytel

A new, up-to-the-minute book that clears away the confusion and misunderstanding most people have about UHF. Written in clear, easy-to-understand terms, this book covers both fundamental theory and practical, working applications with special emphasis on television. Present-day brand name converters—UHF test equipment—circuit components—tubes, etc. Here is profitable and practical reading for anyone who will be working with UHF for service bench, school or laboratory use. Typical chapters include: UHF Receiving Antennas; Electromagnetic Radio Waves; Transmission Lines; Waveguides. Illustrated and indexed with approx. 400 (5½ x 8½") pages bound in cloth cover .....\$6.60

Buy these books now at your jobbers...leading bookstores...or—

---MAIL THIS COUPON—TODAY---

**JOHN F. RIDER, Publisher, Inc.**  
480 Canal Street, New York 13, N. Y.

Please send me book(s) circled. I understand, if not satisfied, I may return them within 10 days for full refund. 1 2 3

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ ZONE \_\_\_\_\_  
STATE \_\_\_\_\_ 1RE  
(Please Print)



A Federated SPECIAL  
**WHILE THEY LAST!**

COMPARE THESE  
EXCLUSIVE FEATURES!

- 1 Special clamp for easy installation on rear of TV set, wall, or outside of window.
- 2 Felt-lined bracket to protect cabinet finish.
- 3 3-section di-poles telescope to desired length for all-channel reception.
- 4 Plated — brass construction.
- 5 Ball socket plus swivel joint for quick extension in any direction.
- 6 Easy-to-attach lead-in wire with lugs.

**CHANNEL MASTER  
CLAMP-ON  
INDOOR-OUTDOOR  
TV ANTENNA**

**\$139**

MODEL #IN 852  
Regular List Price  
**\$425**

The only  
Antenna at  
this price  
with all these  
features —  
Act and Save  
NOW ... They're  
moving fast!

**EXTRA!** Mention this ad at your nearest  
FEDERATED Supply Center to obtain 10 antennas  
for \$12.50. Cash in on this money-saving offer now!

**Federated Purchaser**  
NATION'S ONLY COAST-TO-COAST ELECTRONICS DISTRIBUTOR  
TELETYPE: NY1-2859 (New York, N.Y.) • LA-572 (Los Angeles, Cal.) • AN-22 (Allentown, Pa.)

- New York City 7, N. Y., 66 Dey St.,
- Newark, N. J., 114 Hudson St.,
- Allentown, Pa., 1115 Hamilton St.,
- Easton, Pa., 925 Northampton St.,
- Los Angeles 15, Cal., 911 So. Grand Ave.,

**ARKAY**  
world's finest radio kits  
Write for free brochure  
RADIO KITS, INC., 120 Cedar St., N. Y. 6

**CODE SENDING  
RECEIVING SPEED**  
Be a "key" man. Learn how to send and receive messages in code by telegraph and radio. Commerce needs thousands of men for jobs. Good pay, adventure, interesting work. Learn at home quickly through famous Candler System. Qualify for Amateur or Commercial License. Write for FREE BOOK.  
CANDLER SYSTEM CO.  
Dept. 3-A, Box 928, Denver 1, Colo., U.S.A.

**Used Recording Tape (Plastic Base)**

**199** For 7"—1200 foot Plastic reel. Save \$3.51 on every reel.

Money cheerfully refunded if you do not find this tape cleanly erased and as good as new. (If you are skeptical and from Missouri! send us 12c in stamps and we'll roll you a sample.)

- We buy commercial and government surplus plastic tape. Tape must be Irish (2211 RPA), Scotch, or Audio tape, or any tape that will meet government specifications and must not have more than one splice in any 1200 foot spool.

New empty plastic reels in boxes for easy labeling, 3"—10c; 5"—24c; 7"—30c each.

• We carry new recorders, recording blanks, tape, tape recorders, etc. at large savings. PLEASE INCLUDE SUFFICIENT POSTAGE.

**COMMISSIONED ELECTRONICS CO.**  
2405 18th St., N.W. Washington 9, D. C.

**Leotone**

ANB-M-C1 Magnetic Mike w/cord & plug..... \$5.98  
ANB-H-1 Phone Units... 300 ohm impd., ea. .98  
Crystal Hand Mike... hi-impd., hi-fidelity.  
Moulded bakelite case; shielded cable..... 3.95  
6V. AC-DC Plunger Solenoid (1 1/2"x1/2")..... \$5.98  
De-Magnetizer... 115V. 1.29  
AC Highly efficient.....  
TU-17 Tuning Unit (BC223) 2-3Mc. Like new..... 2.49  
BC-606 Interphone Control Box... new..... .69  
4 Gang Variable Condenser... 250 mmf. per sect. 1.29  
1/4" shaft 7 1/2"x3 1/4"x2 3/4"  
2 Gang Variable... Superhet or TRF. Either... .69  
"ALNICO MAGNETS" "U" Magnet, 1"x 7/8"x3/8"..... \$4.49  
Round Bar St... 2"x3/4" O.D., ea. \$9.10 12/5.50  
Block Magnet... 1/2" sq. 8/8" ea. 25¢ 12/2.50  
Flat Bar... 1/8"x1"x5/16" ea. 79¢ 6/3.95  
Alnico "Chip" Magnets... small irreg. shapes. Approx. 90 pcs./oz. 1.5¢ oz. \$1.50 lb.  
Alnico Magnet Kit... Powerful Bar, Block, "U", Rod, etc. Kit of 10 asstd. 1.98  
(WRITE FOR LATEST "ALNICO" SUPPLEMENT)

Super-Flexible "Kinkless" Braided Wire (220) cop- per, cotton core & sleeve. WITHSTANDS CONTINU- OUS BENDING in Relays, Spkrs., etc. 20 ft./98¢ 100 ft./\$3.75 1000 ft./\$32.50  
Experimental Tubes for Test, Research, etc. Fil. tested. 40 asstd. revg. types..... \$1.98  
5" C.R. Tube Front Bezel... blk. crackle..... .89  
5" Scope Visor... flex. vinyl..... .89  
5" Scope Grid... 360° radial calibrated..... .39  
5 1/4" Convex Lens... clear glass. Round..... .39  
Cabinet Draw Slides... silent ballbearings  
13" (9" ext.)—\$2.10 pr. 15" (11" ext.)—\$2.25;  
16 1/2" (12 1/2" ext.)—\$2.39; Hvy. Duty, All Steel 16 1/2" (12 1/2" ext.)..... 3.25  
12 1/2" Ft. Whip Antenna... 4 steel screw stems 1.98

**"JUMBO RADIO PARTS KIT"**... 17 FULL LBS. of: COILS, SWITCHES, CONTROLS, SOCKETS, RESISTORS, CONDENSERS, WIRE, HARDWARE—PLUS MUCH, MUCH MORE! (Shpg. wt. 20 lbs.)—  
**\$9.95**

**"MOTOR SPECIALS"**... 5 RPM TIMING MOTOR (Bristol), 115V., 60cy., 2W. 1 1/4"x2" O.D., \$3.49  
1/40 HP AC Motor (Robbins & Myers), 115V., 60cy., 1650 RPM. 5/16" O.D. shaft. With con- denser & SPDT switch. 4 1/4"x4 1/4" O.D. Shpg. wt. 6 lbs. 4.95  
1 1/2 HP. G.E. Motor (Type DP), 115V., 60cy., 1700 RPM. 7/8" shaft. 110V. DC. 4 3/4"x5 1/2". Fully enclosed. Shpg. wt. 13 lbs.—  
ONLY \$2.95

Hi-Fidelity Crystal Mike... hi-impd. Rubber shock-mtd. Less housing—(1 1/4"x1 1/4")..... 1.29  
Aluminum Housing for crystal mike..... 1.15

**"DIRECT FACTORY SPEAKER REPAIRS SINCE 1927"**  
Min. order deposit req. on all C.O.D.'s. Full remittance with foreign orders. Please add suf- ficient postage—excess refunded.

**LEOTONE RADIO CORP.**  
67 Dey Street  
New York 7, N. Y.

**TELEVISION SERVICING**  
by Walter H. Buchsbaum

Get this brand new, complete handbook for sure-fire working knowledge of TV installation, maintenance and troubleshooting. Tells you step-by-step procedures for audio IF alignment, video IF alignment, aligning RF amplifiers, mixers, oscil- lators, etc. All possible defects classified for ready reference, thoroughly analyzed to show what is wrong and why... and what to do to correct the defect. No mathematical knowl- edge needed! Practical, author- itative, up-to-the minute, the perfect handbook for set own- ers, trainees, and repairmen.

340 pages  
170 illustrations

Symptoms of de- fective operation easily recognized, quickly corrected by illustrations, diagrams and how- to-do-it facts in this new book.

**USE IT 10 DAYS FREE**

Coupon below brings you "Television Servicing" on FREE trial for 10 days, without obligation. Mail it NOW.

**PRENTICE-HALL, INC., Dept. M-RE-153**  
70 Fifth Ave., New York 11, N. Y.

Send me, for 10 DAYS' FREE TRIAL, "Television Servicing." I will return it in ten days and pay nothing—or keep it and send \$1.95 down (plus postage) and \$2 monthly for 2 months.

NAME.....  
ADDRESS.....  
CITY..... ZONE..... STATE.....

SAVE! Send \$5.35 with this coupon, and we'll pay postage and packing.

**RADIO-ELECTRONICS**

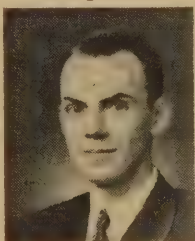


Dr. John Ruze joined the GABRIEL LABORATORIES, Division of The Gabriel Co., Needham Heights, Mass., as director of research. The laboratories provide research and development facilities in



the electronics field to other Gabriel divisions, including Ward Products and Workshop Associates. Dr. Ruze comes to Gabriel from the Air Force Cambridge Research Laboratories where he was assistant director of the Antenna Laboratory.

A. L. Champigny was promoted to supervisor of replacement sales promotion for GENERAL ELECTRIC's Tube Department in Schenectady, N. Y. He will direct the promotion of G-E tube sales through distributors. He was formerly promotion service supervisor for the company's Large Motor and Generator Department.



A. L. Champigny

George Gemberling was named Western District manager for the ALLIANCE MANUFACTURING Co., Alliance, Ohio, maker of *Tenna-Rotors*, boosters and other electronic components. He has been with the company for the past two-and-a-half years.



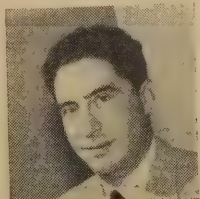
G. Gemberling

Dr. James W. McRae, vice-president of Bell Telephone Laboratories, was elected president of the INSTITUTE OF RADIO ENGINEERS for 1953. He succeeds Dr. Donald B. Sinclair of the General Radio Co. S. R. Kantebet of the Government of India Overseas Communications succeeds Harold L. Kirke as vice-president of the I.R.E. Stuart L. Bailey, of Janskey and Bailey, and B. E. Shackelford of the RCA International Division were elected I.R.E. directors for 1953-1955.



Dr. J. W. McRae

Mike Meyers joined RMS (Radio Merchandise Sales) New York City, as chief field engineer. He will assist distributors and service technicians with antenna problems and help conduct the RMS technical forums now being given throughout the country. Meyers has had wide experience in the field.



M. Meyers

# great TV news! Fringe Beam

TRADE MARK

## Highest POWER-GAIN Antenna ever!

### 10 Element Yagi with

- ★ 100% more power gain than an 8 element yagi
- ★ 75% more power gain than usual 10 element yagi
- ★ *Fringe-Beam* gives HIGHEST POWER regardless of number of elements

Extensive tests . . . under all conditions; in FRINGE, near fringe and primary areas—in the North, South, East and West—conclusively proved that *Fringe-Beam* outgains any antenna. It's beyond comparison with any in today's market.

Leading installation companies, dealers and servicemen recommend the *Fringe-Beam* 10 element yagi with full confidence. Customers are grateful.



Fringe-Beam  
10 Element Yagi

#### EXCLUSIVE FEATURES:

- Low standing wave ratio, 1.1 to 1 or less for nearperfect match to 300 ohm line
- Boom braced on both high and low channels
- 4-element dipole with large area presents low Q; maximum pick-up and broad response for both picture and sound
- 95% power gain over a single bay when antenna is stacked
- Excellent pattern and front-to-back ratio
- Free stacking bars
- Lightweight, well constructed with seamless tubing, plated screws and nuts with high grade Micarta for low loss insulation. Well balanced, good appearance
- Pre-assembled for fast, easy installation. All elements crimp at ends
- Guaranteed
- Excellent profits
- Assures satisfied customer

**JOBBER—REPS!** Some major territories available.

Get complete data; volume sales and unusual profits!

## NEAL ELECTRONIC CO.

Huntsville,

Alabama

## Now JSC Announces . . . Expanded 300 Ohm TV Lead-in Wire Line!

JSC proudly announces a complete range for:



#### 22 gauge copper

40 mil  
55 mil  
70 mil  
80 mil  
100 mil

#### 20 gauge copper

40 mil  
55 mil  
70 mil  
80 mil  
100 mil

4-Conductor Rotor Wire  
Perforated 300 Ohm Open Wire

JSC has highest quality wire at lowest possible prices.

Lithographic spools of orange and blue individually packed 1000 feet to the metal spool.

See your nearest JSC distributor who proudly displays the Blue and Orange disc of quality.

### SERVICE TECHNICIANS

What was your most unusual service case? Not necessarily the most difficult one, but the one you will remember longest, either because of the problem itself or because of other conditions surrounding the job. If the experience was interesting to you, it probably will be to other readers of RADIO-ELECTRONICS. We will pay \$10 for each "My Most Unusual Service Job" item we consider outstanding enough to publish in this magazine. If the item is striking enough or carries sufficient technical information to be worth more than \$10 in our opinion, it will be paid for at our regular space rates. Address your stories to

Unusual Service Job  
RADIO-ELECTRONICS

25 West Broadway

New York 7, N. Y.



# FREE *Equipto* CATALOG!

Especially Designed for the ELECTRONICS Industry



Steel is Finished in Polymerized Shock-Proof Insulating Enamel.

Equipto's especially designed Electronics Equipment is used by thousands of the country's largest radio, television and electrical service shops and stores. Combining strongest possible construction with moderate prices, even the small budget shop can take full advantage of Equipto's complete line of storage and work shop equipment.

Merchandise displayed on Equipto's well-styled units always boosts sales. These units give better than **ONE-THIRD** more display and storage space for items now occupying the same area.

Have you a storage or display problem?

We'll be glad to help you.



## Equipto

Division of Aurora Equipment Co.  
635 Prairie, Aurora, Illinois  
Phone: Aurora 9231

WRITE  
FOR FREE  
CATALOG

## SHOOT TV TROUBLE FAST!

### With H. G. Cisin's Copyrighted RAPID "TV TROUBLE SHOOTING METHOD"

Without experience or knowledge, this *guaranteed* new method of servicing TV sets enables you to **DIAGNOSE** TV troubles as rapidly as an expert. **NO THEORY—NO WAIT**—you can locate all faults in record-breaking time, regardless of make or model.

"TV TROUBLE SHOOTING METHOD" is the most valuable aid to TV servicing ever written. Be a TV Trouble Diagnostician. Increase your present earnings. Open your own Profitable Business or get a high-paying skilled job.

It's all in this book . . .  
Nothing more to Pay—Nothing else to Buy

Alphabetically listed, there are 85 picture troubles, over 58 raster and 17 sound troubles and by this unique copyrighted method you know **EXACTLY** WHERE the trouble is; plus step-by-step instructions, including 69 **RAPID CHECKS**, enabling you to find the faulty part.

**13 IMPORTANT PRELIMINARY CHECKS NEED NO INSTRUMENTS!** Of the 69 Rapid Checks, **OVER 65 ALSO REQUIRE NO INSTRUMENTS!** Rapid checks include emergency checks for distorted pictures, defective tubes including PIX tube, plus 57 others. **ALL EXPLAINED IN SIMPLE LANGUAGE, PERFORMED WITHOUT INSTRUMENTS, MANY CHECKS USE THE PICTURE TUBE AS A GUIDE.**

H. G. Cisin, the author, is the inventor of the AC/DC midjet radio. He licenses RCA, AT&T, etc. He has also trained thousands of technicians now owning their own prosperous TV service organizations or holding highly paid TV positions. His years of experience are embodied in this remarkable new TV TROUBLE SHOOTING METHOD.

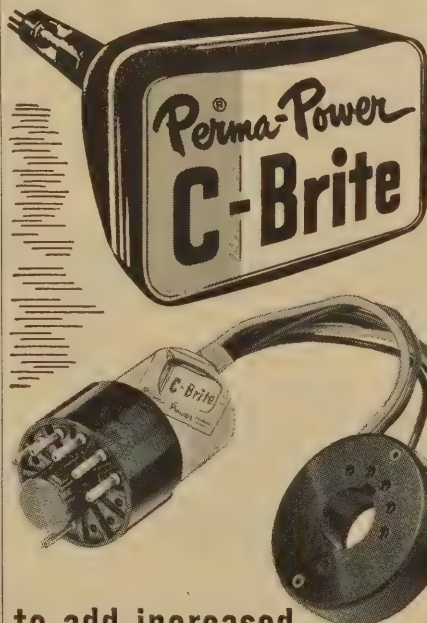
Guaranteed, Money Back in 5 Days if Not Satisfied!

If you use coupon below you will receive, **ABSOLUTELY FREE**, a copy of H. G. Cisin's new book "TV Terms Simply Explained Including Picture Guide" which sells for \$1. **ACT NOW** and get both books post-paid at the cost of only one.

**RUSH COUPON NOW!**

H. G. CISIN, CONSULTING ENGINEER, (Dept. E-17)  
200 Clinton Street, Brooklyn 2, N. Y.  
Enclosed find \$1. Rush both books.

Name . . . . .  
Address . . . . .  
City . . . . . Zone . . . . . State . . . . .



to add increased  
brilliance to any  
TV PICTURE TUBE

manufactured by  
**Perma-Power COMPANY**  
Chicago 25, Illinois  
Manufacturers of Electronic Equipment Since 1928

of radar installation and television during the past 16 years.

Earl Kirk was promoted to distributor sales manager of the Regency Division of I.D.E.A., Indianapolis, Ind., manufacturer of boosters, converters, and other electronic equipment. He was formerly assistant sales manager. At the same time, Richard W. Mitchell, sales manager, announced that Edward M. Sheridan had joined the company as industrial sales manager. Sheridan was formerly with RCA.



E. Kirk

### Personnel Notes

. . . Brigadier General David Sarnoff, Chairman of the Board of the Radio Corporation of America, was named by the U.S. Department of Defense to head the CITIZENS ADVISORY COMMISSION ON MANPOWER UTILIZATION IN THE ARMED SERVICES.

. . . Tom Cox, long associated with the electronics industry in sales and engineering positions, joined NATIONAL UNION RADIO CORP. as district manager for the Renewal Sales Division in the New Jersey and Eastern Pennsylvania territory.

. . . Harris D. Myers and Elmer G. Flood joined the Sound Equipment Division of STROMBERG-CARLSON, Rochester, N. Y., as field engineers. At the same time, A. L. Sebastian and Henry A. McMichael joined the company as sales engineers in the Sound Equipment Division. All have had wide experience in the field.

. . . Charles Maechling, Jr., was appointed government relations officer of the RTMA. He was formerly in the Office of the General Counsel of the Department of the Air Force. The association also named Stanley H. Manson of Stromberg-Carlson as vice-chairman of public relations on the RTMA Public Relations and Advertising Committee. He succeeds James M. Toney, who resigned after being assigned to a new position within RCA.

. . . Dr. Allen B. Du Mont was re-elected president of ALLEN B. DU MONT LABORATORIES. Other officers re-elected were Stanley F. Patten, vice-president; Paul Raibourn, treasurer; Bernard Goodwin, secretary, and Irving Singer, assistant treasurer.

. . . Edward Porter Robinson was promoted to plant manager of the ESPEY MANUFACTURING Co., New York City.

. . . Dr. Francis M. Wiener joined SPENCER-KENNEDY LABORATORIES, Cambridge, Mass., as section head in the Engineering Department. He was formerly with Bell Telephone Laboratories.

. . . Leon Marshall, who formerly operated  
RADIO-ELECTRONICS



ated his own art service, joined INSULINE CORP. OF AMERICA, Long Island City, N. Y., as assistant to Alfred S. Chambers, advertising manager.

... Reinhold W. Schmidt was promoted to manager of Equipment Engineering and Maintenance of the Cathode-Ray Tube Division of ALLEN B. DU MONT LABORATORIES.

... F. Sumner Hall, of Audio Equipment Sales Co., was installed as fifth president of the AUDIO ENGINEERING SOCIETY. Other officers include: Jerry B. Minter, Measurements Corp., Executive vice-president; Walter S. Pritchard, Ohio Bell Telephone, Central vice-president; Richard L. Burgess, Allied Record Manufacturing Corp., Western vice-president; C. J. LeBel, Audio Instrument Co., secretary; and Ralph A. Schlegel, WOR Recording Studios, treasurer.

... Dan D. Halpin, general sales manager of the Receiver Division, Allen B. Du Mont Laboratories, was elected an Honorary Life Member of the RADIO AND TELEVISION EXECUTIVES SOCIETY. He was so honored as a past president of the American Television Society which with the Radio Executives Club merged into the new organization.

... Frank Toler joined the HALLICRAFTERS Co., as district sales manager with headquarters in Nashville, Tenn. He was formerly with Tempco, Inc.

... Abraham Hyman, formerly the supervisory electronic engineer for the Civil Aeronautics Administration in New York, joined JFD MANUFACTURING Co., as an electronic consultant.

... Donald N. Kirkpatrick was appointed chief engineer of the NATIONAL Co., Malden and Melrose, Mass., manufacturer of communication radio receivers, electronic equipment and components. He formerly held a similar position with Boonton Radio Corp.

... Edward A. Malling, a former sales manager on the staff of the GENERAL ELECTRIC Receiver Department, was appointed manager of marketing for the Components Department.

... R. Gordon Dougherty, a veteran of the action in Korea, joined I.D.E.A., Indianapolis, as a field representative of the Regency Division. Before entering the service, Dougherty was a sales representative for I.D.E.A.

... Marshall A. Williams was appointed regional manager of the Government and Industrial Division of PHILCO CORP. with headquarters in the Beverly Hills office. He was formerly with Hughes Aircraft.

... Eugene M. Keys was elected executive vice-president and director of sales of EDWIN I. GUTHMAN & Co., INC., Chicago. He was also appointed a member of the Board of Directors. Keys was formerly vice-president in charge of sales.

END



**UHF... and really HOT!**

**TATCO**

**FULL DETAILS AT YOUR DISTRIBUTOR**

**BOW TIE**

**UHF**

**TECHNICAL APPLIANCE CORPORATION**  
SHERBURNE, N. Y.



**TV Receiver Sensitivity Measurements made Simple with**

**The New Portable "SensiMeter"\***

**...a "must" in fringe areas**

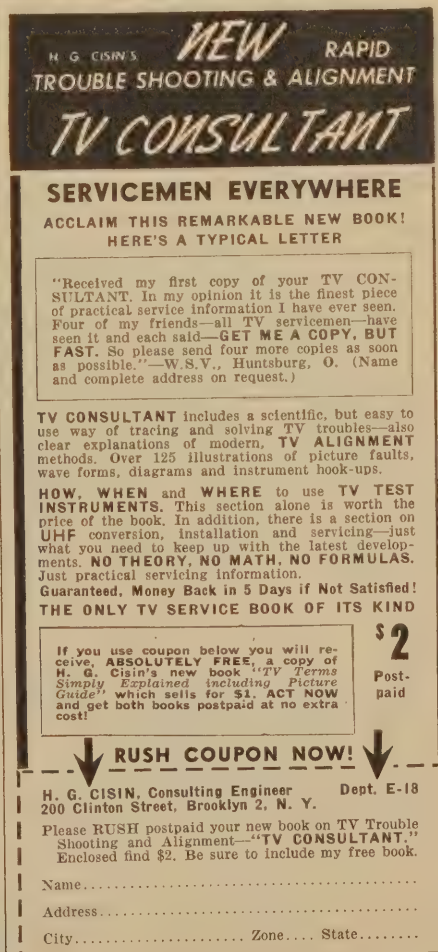
**Net \$129.50**  
\*Pat. Applied For

- \* Takes the guesswork out of TV service
- \* Checks receiver from antenna terminals to picture tube
- \* Microvolt scale is divided into 3 sections as a guide for the servicemen
- \* Sensitivity testing is accepted by servicemen as the best method of determining the cause of bad pictures

Approved by leading television manufacturers!

Carried by leading jobbers!

**SI SERVICE INSTRUMENTS COMPANY**  
422 South Dearborn Street, Chicago 5, Illinois



**H. G. CISIN'S NEW RAPID TROUBLE SHOOTING & ALIGNMENT TV CONSULTANT**

**SERVICEMEN EVERYWHERE**  
ACCLAIM THIS REMARKABLE NEW BOOK!  
HERE'S A TYPICAL LETTER

"Received my first copy of your TV CONSULTANT. In my opinion it is the finest piece of practical service information I have ever seen. Four of my friends—all TV servicemen—have seen it and each said—GET ME A COPY, BUT FAST. So please send four more copies as soon as possible."—W.S.V., Huntsburg, O. (Name and complete address on request.)

TV CONSULTANT includes a scientific, but easy to use way of tracing and solving TV troubles—also clear explanations of modern, TV ALIGNMENT methods. Over 125 illustrations of picture faults, wave forms, diagrams and instrument hook-ups.

**HOW, WHEN and WHERE to use TV TEST INSTRUMENTS.** This section alone is worth the price of the book. In addition, there is a section on UHF conversion, installation and servicing—just what you need to keep up with the latest developments. **NO THEORY, NO MATH, NO FORMULAS.** Just practical servicing information.

**Guaranteed, Money Back in 5 Days if Not Satisfied!**  
**THE ONLY TV SERVICE BOOK OF ITS KIND**

If you use coupon below you will receive, **ABSOLUTELY FREE**, a copy of H. G. Cisin's new book "TV Terms Simply Explained including Picture Guide" which sells for \$1. **ACT NOW** and get both books postpaid at no extra cost!

**\$2 Post-paid**

**RUSH COUPON NOW!**

H. G. CISIN, Consulting Engineer Dept. E-18  
200 Clinton Street, Brooklyn 2, N. Y.

Please RUSH postpaid your new book on TV Trouble Shooting and Alignment—"TV CONSULTANT."  
Enclosed find \$2. Be sure to include my free book.

Name.....  
Address.....  
City..... Zone..... State.....



to the

## ELECTRICAL ENGINEER

or

## PHYSICIST

with experience in

## RADAR

or

## ELECTRONICS

*Hughes Research and Development Laboratories, one of the nation's leading electronics organizations, are now creating a number of new openings in an important phase of their operations.*

*Here is what one of these positions offers you:*

### THE COMPANY

Hughes Research and Development Laboratories, located in Southern California, are presently engaged in the development and production of advanced radar systems, electronic computers and guided missiles.

### THE NEW OPENINGS

The positions are for men who will serve as technical advisors to government agencies and companies purchasing Hughes equipment—also as technical consultants with engineers of other companies working on associated equipment. Your specific job would be essentially to help insure successful operation of Hughes equipment in the field.

### THE TRAINING

On joining our organization, you will work in the Laboratories for several months to become thoroughly familiar with the equipment which you will later help users to understand and properly employ. If you have already had radar or electronics experience, you will find this knowledge helpful in your new work.

### WHERE YOU WORK

After your period of training—at full pay—you may (1) remain with the Laboratories in Southern California in an instructive or administrative capacity, (2) become the Hughes representative at a company where our equipment is being installed, or (3) be the

Hughes representative at a military base in this country or overseas (single men only). Compensation is made for traveling and moving household effects, and married men keep their families with them at all times.

### YOUR FUTURE

In one of these positions you will gain all-around experience that will increase your value to our organization as it further expands in the field of electronics. The next few years are certain to see large-scale commercial employment of electronic systems. Your training in and familiarity with the most advanced electronic techniques now will qualify you for even more important future positions.

*How to apply:*

## HUGHES

RESEARCH AND  
DEVELOPMENT LABORATORIES

Engineering Personnel Department  
Culver City,  
Los Angeles County, California

*If you are under thirty-five years of age, and if you have an E.E. or Physics degree, write to the Laboratories, giving resumé of your experience.*

*Assurance is required that relocation of the applicant will not cause disruption of an urgent military project.*

### Radio-Electronics Annual Index

Volume XXIII	Oct. 1951 - Dec. 1952	DATE	PAGE
A			
AIRCALL		Oct. 51	74
AMATEUR			
Bedside control unit		Oct. 51	86
Codetypewriter		May 52	68
Crystals, uses for		Apr. 52	57
Frequency spotter, crystal		Jun. 52	51
Key, electronic		Oct. 51	105
From standard "bug"		Oct. 51	88
Modulator, clamp-tube		Jun. 52	52
Monitor, phone-c.w.		Jan. 52	126
Oscillators			
Crystal-controlled		Dec. 51	50
Test instrument, multipurpose		May 52	53
Variable-frequency oscillator		Dec. 51	68
Variable-frequency, beginners		Feb. 52	66
Receivers—See also			
Receivers, communications			
Band switching		Mar. 52	84
Improvements for 160 meters		Dec. 52	84
Preselector for		Jul. 52	53
Television interference			
21-mc		Jul. 52	29
Filters for		May 52	44
Service tech and		Jul. 52	34
Transmitters			
Novice		Jul. 52	57
Ten-watt, compact		Dec. 52	60
Transmitter-receivers			
Ten-meter, pack set		Oct. 52	94
No. 19, Mark II, conversion		Nov. 51	85
AMPLIFIERS—See also Audio			
Magnetic		Jun. 52	56
Wide-band chain type		Feb. 52	62
ANTENNAS			
Beyond-fringe		Mar. 52	27
Discone		Nov. 51	39
Dummy, for servicing		Jun. 52	35
TV antennas—See Television			
AUDIO			
Amplifiers			
3-channel		Dec. 51	27
8-watt		Feb. 52	110
100-watt		Nov. 51	70
Cathode-follower		Sep. 52	72
Constant-voltage output system		Feb. 52	44
Direct-coupled		Dec. 52	33
General-purpose		Mar. 52	40
Grounded-grid		Oct. 52	46
Limiting, RCA BA-6A		Oct. 51	58
Miniature		Aug. 52	73
Mixer, 4-channel		Apr. 52	39
Preamp, mixing, 4-channel		Dec. 51	28
Phonograph, transformer-coupled		May 52	59
Remote-controlled		Jan. 52	86
Response checking with sawtooth wave		Nov. 52	36
Response variation		Mar. 52	36
Revamping with feedback		Oct. 51	40
Synthetic bass circuit		Jan. 52	143
Williamson		Jul. 52	46
Bridge circuit uses		Nov. 52	78
Design, push-pull drivers		Dec. 52	36
Distortion			
Intermodulation test standards		Oct. 51	70
Meter		Dec. 51	34
Phase-shift, meter		Aug. 52	42
Equalizers			
Design		Dec. 52	30
Wide-range		Oct. 51	102
Filters, design—See Theory			
Frequency meter		Feb. 52	25
Impedance measurement		Apr. 52	29
Improved, for 630 TV		Dec. 51	43
Intercoms		Oct. 51	42
Cold-cathode tube		Nov. 51	78
One-tube		Jul. 52	90
Masco Wirelesfone		Nov. 52	34
Loudspeakers			
Crossover networks		Jul. 52	43



# WINCHARGER

## NEW LOW COST TELESCOPING TV ANTENNA SUPPORT

Pat. Applied For

Wincharger . . . pioneer in guyed tower, presents a new design in **HIGH QUALITY, RUGGED, DURABLE** TV Antenna Support Masts at a budget price. Properly guyed, these masts will support large antenna arrays against high winds and heavy ice loads.

**SAFER  
EASIER  
FASTER**

### Exclusive 3-Point SAFETY CLAMPING RING

with a smoother guying surface, provide maximum rigidity against tubes twisting and loosening inside each other due to high winds. Aids in erecting a straighter mast.



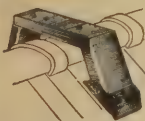
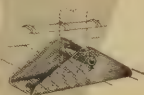
### AUTOMATIC SAFETY CLIP



Assembly Tool. Snaps in place with a "click", warning that tube has been pulled out as far as it can safely go. Made of heavy-gauge spring steel wire. This is an exclusive Wincharger safety feature.

### A WINCHARGER BASE FOR EVERY TYPE ROOF

Hinged Foot for flat and sloping roofs.



Ridge Straddler . . . for use on broad or ridged roofs, such as tile, etc.

Ridge Straps . . . A simple mounting where there is no ridge roll to bridge.



**Sell WINCHARGER**

**SAFETY and FASTER,  
EASIER INSTALLATION.**

**Sell WINCHARGER**

**TELESCOPING TV  
ANTENNA SUPPORT  
MASTS**

Order now from your jobber—  
or write for complete details

**WINCHARGER**  
CORPORATION  
SIOUX CITY 2, IOWA

	DATE	PAGE
Inductors for	Nov. 52	32
Corner	Oct. 51	108
Folded horn	Feb. 52	111
Plaster, French	Aug. 52	41
Eggshell diaphragm for	Oct. 52	51
lonophone	Nov. 51	44
Circuitry for lonophone	Dec. 51	33
Mixer, cathode follower	Nov. 51	40
Mobile demonstration unit	Oct. 52	50
Musical instruments, electronic		
Baldwin organ	Nov. 51	60
	Dec. 51	30
	Jan. 52	76
	Mar. 52	38
	Sep. 52	48
	Oct. 51	44
	Apr. 52	32
	Jun. 52	44
	Jul. 52	48
	Aug. 52	44
	May 52	56

Consonnata  
Construction hints  
Hammond organ  
Lowrey Organo  
Minshall organ

Solovox	
Noise Neutralizer—See Fiction	
Noise suppressors, automatic	Nov. 51 106
Oscillators—See Audio Signal	
Output meter	Nov. 51 108

Phonograph	
Oscillator, FM	Nov. 52 37
Records, playback curves	Mar. 52 42
Improved fidelity for	Dec. 52 34
portable	
Quality factors in	Dec. 51 24
Recorders, tape	Oct. 52 52
Mechanical maintenance	Sep. 52 51
Professional models	Nov. 52 38

Recording	
Film-C-R tube method	Apr. 52 26
Tape	Aug. 52 38
Reverberator, artificial	Jul. 52 51
Sales demonstration room	Aug. 52 36

Signal generators	
41-10,000-cycle, R-C	Dec. 51 93
Beat-frequency	Nov. 52 54
Calibrating	Nov. 52 30
Square-wave	Aug. 52 72
With calibrated output	Nov. 51 34

Vacuum-tube voltmeters	
Sensitive	Oct. 52 74
Uses	Jan. 52 105
Volume expander	Oct. 51 103
	Jun. 52 92
	Feb. 52 46
Waveform analysis	

B

Blasting caps, radio detonation of	Dec. 52 49
Bismuth magnetic phenomena	Nov. 51 41

### BROADCASTING AND COMMUNICATIONS

Maintaining two-way radio	Mar. 52 46
Studio equipment, operation	Apr. 52 70
	Feb. 52 52
	Mar. 52 54
TV news program	Sep. 52 61

C

Carrier-current telephone system	Nov. 51 78
Cathode followers	Sep. 52 72
Codan—See Receivers	

### COMPUTERS

Counter, flip-flop	Nov. 52 58
Mechanical squirrel	Dec. 51 46
SEAC	Oct. 51 43

### CONSTRUCTION—See also

Individual heads, Receivers, etc.	
Chassis, breadboard,	May 52 94
experimental	
Screen-metal	Nov. 52 92
CONVERSIONS, LARGE-SCREEN TV	
Details	Mar. 52 24
Last word on	Aug. 52 26
	Sep. 52 34
	Jan. 52 56
	May 52 36
	Oct. 52 33

630 to 17 inches	
RCA 9T-270	
Set with r.f. power supply	
Crossover networks—See Audio	
CRYSTAL DIODES	
In ring modulator	Oct. 51 68
Photodiodes	Mar. 52 62

# COMPLETE TRAINING FOR BETTER RADIO-TV SERVICE JOBS



Let these two great new Ghirardi training books teach you to handle all types of AM, FM and TV service jobs by approved professional methods—and watch your efficiency and earnings soar!

Completely modern, profusely illustrated and written so you can easily understand every word, these books pave the way to fast, accurate service on any type of home radio-TV-electronic equipment ever made. Each book is brand new. Each contains the latest data on the latest methods and equipment—NOT a re-hash of old-out-of-date material. Each is co-authored by A. A. Ghirardi whose famous RADIO PHYSICS COURSE and MODERN RADIO SERVICING were, for 20 years, more widely used for military, school and home study training than any other books of their type!

## THE NEW Ghirardi RADIO-TV SERVICE LIBRARY

Almost 1500 pages and over 800 clear illustrations show step-by-step how to handle every phase of modern troubleshooting and servicing.

### 1—Radio and Television Receiver TROUBLESHOOTING & REPAIR

A complete guide to profitable professional methods. For the novice, it is a comprehensive training course. For the experienced serviceman, it is a quick way to "brush up" on specific jobs, to develop improved techniques or to find fast answers to puzzling service problems. Includes invaluable "step-by-step" service charts. 820 pages, 417 illus., price separately \$6.75.

### 2—Radio and Television Receiver CIRCUITRY AND OPERATION

This 680-page volume is the ideal guide for servicemen who realize it pays to know what really makes modern radio-TV receivers "tick" and why. Gives a complete understanding of basic circuits and circuit variations; how to recognize them at a glance; how to eliminate guesswork and useless testing. 417 illus. Price separately \$6.

### New low price . . . easy terms

If broken into lesson form and sent to you as a "course", you'd regard these two great books as a bargain at \$50 or more! Together, they form a complete modern servicing library to help you work faster and more profitably. Completely indexed so you can look up needed facts in a jiffy. Under this new offer, you save 75¢ on the price of the two books—and have the privilege of paying in easy installments while you use them! No lessons to wait for.

### 10-DAY EXAMINATION PRIVILEGE

Dept. RE-13, Rinehart Books, Inc.,  
Technical Division,  
232 Madison Ave., New York 16, N. Y.

Send me GHIRARDI'S NEW 2-VOL. SERVICE LIBRARY. I enclose \$3 and will send you \$3 a month for three months until the total price of only \$12.00 plus a few cents postage is paid. It is understood I may read the books for 10 days. Then, if not satisfactory, I will return them postage paid and you agree to refund my \$3 and cancel the remaining installments. (Books shipped postpaid if full remittance accompanies order. Same return privilege.)

Name \_\_\_\_\_

Address \_\_\_\_\_

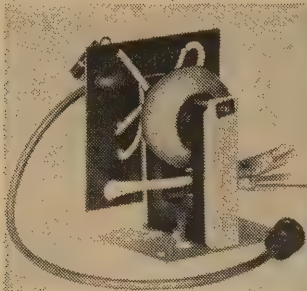
City, Zone, State \_\_\_\_\_

Employer's Name & Address \_\_\_\_\_

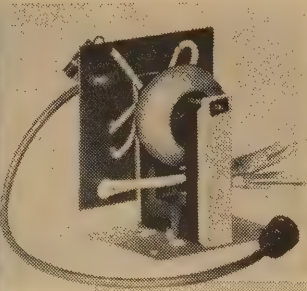
OUTSIDE U.S.A.—\$13.00 cash only. Same 10-day return privilege with money refunded.



ORIGINAL



REPLACEMENT



can you tell... which transformer is the RAM?

If you can't tell any difference between the original and replacement flybacks these days, there's good reason. They're TWINS—they're BOTH RAMS!

Yes, the great majority of famous TV set manufacturers order their original flybacks built to their own specifications by RAM. They know that a RAM-built original surpasses their every quality and performance standard.

Under the special RAM twin-transformer manufacturing technique, in most instances the originals destined for the TV set maker and the replacements destined for the RAM-brand and your jobber's shelf are both made at exactly the same time, during the identical production run!

That's why you can be certain—9 times out of 10—that a RAM-brand replacement is the best replacement, for highest efficiency and durability. And that's why RAM components are lowest-priced in the industry, for highest profits for you.

**ONLY RAM** manufactures 29 types of transformers, 10 types of deflection yokes and 15 types of linearity and width coils—the industry's most complete, most diversified sweep replacement line. See them at your local distributor.

**FREE!**

RAM 1953-edition Replacement & Conversion Manual—over 5000 sweep component listings—most complete in the industry. Write Dept. RE-1.



**Ram**

**ELECTRONICS SALES CO.**  
IRVINGTON-ON-HUDSON, N. Y.

TEST-PATTERN TESTED COMPONENTS FOR TV

## OAK RIDGE CRT TESTER



### "CATHETTE"

is the **ONLY** CRT tester\*

that checks **ALL** the following:

- HIGH VOLTAGE BREAKDOWN
- BEAM CURRENT MEASUREMENT
- ELECTRON GUN CONDUCTANCE
- SHORTS BETWEEN ANY ELEMENTS

Ask to see this INDISPENSABLE new tool at your nearest jobber. You'll agree that it's a **MUST** for every TV Serviceman today! MODEL 106 "CATHETTE" CRT Tester, net

**\$29<sup>95</sup>**

\* Patented

Check these additional patented features:

- Checks gas between elements in Electron Gun
- Checks gas between High Voltage Anode and Electron Gun
- Checks conductance between Cathode, Control Grid, and Screen Grid
- Checks filament continuity
- Checks high voltage on Anode
- Checks Screen to Control Grid voltage from set
- Checks Control Grid to Cathode voltage from set
- Checks leakage
- Tests and positions Ion Trap
- Checks brightness control voltage
- Easy-to-read calibrated DC Voltage scales (0-500V, 0-15KV)
- Easy-to-read tube test scales
- Supplied with duo-decal plug and socket. (Special adaptors available as accessories)
- Pocket size: 5 1/2 x 3 3/4 x 2 1/4". Shpg. wt. 3 lbs.

**MODEL 108 POWER SUPPLY**  
(Pocket Size, same as above), used in conjunction with Cathette CRT Tester, permits testing of Picture Tubes in carton!  
net, **\$19.95**



Send NOW for your copy of our complete new catalog, illustrating and describing the above equipment, as well as all other OAK RIDGE TV Test Instruments.  
Cable Address: "UNIONTEX" N. Y.

**OAK RIDGE PRODUCTS**

92-15 172nd Street • Jamaica, N. Y.

Mfg. Div. of VIDEO TELEVISION INC.

OAK RIDGE PRODUCTS, Dept. RE-1  
92-15 172nd St., Jamaica, N. Y.

Please send your complete new OAK RIDGE Catalog at once, to:

Name.....

Address.....

City.....State.....

Replacing tubes with Crystals, quartz, calibrating Oct. 51 60  
Apr. 52 57

D

DIATHERMY—See Electronics  
DISTORTION—See Audio

E

### EDITORIALS

Service Technicians' Evolution	Oct. 51 21
Radio-Electronic Giant	Nov. 51 23
Is the Vacuum Tube Doomed?	Dec. 51 23
Television at the Crossroads	Jan. 52 25
Television Servicing	Feb. 52 21
Microwave Evolution	Mar. 52 21
Anti-Collision Cars	Apr. 52 25
Go Electronic, Young Man!	May 52 29
1,945 New Television Stations	Jun. 52 25
53 Million TV Sets by 1960	Jul. 52 25
Electronic Brains	Aug. 52 21
Status of European Television	Sep. 52 27
Our Electronic Universe	Oct. 52 29
Magnetic Tape TV Recording	Nov. 52 29
How to Enter the Electronic Industry	Dec. 52 29

ELECTRONICS—See also

### Industrial Electronics

Bismuth in magnetic fields	Nov. 51 41
Cosmotron	Oct. 52 44
Counting rate instrument	Jan. 52 125
Door controller, automatic	Jul. 52 55
Flasher, saturated-core	Dec. 52 62
Garage door opener	Oct. 51 50
Magnetic amplifiers	Jun. 52 56
Medical—See also Ultrasonics	
Diathermy machine	Sep. 52 58
Relaxacisor	Nov. 52 49
Organs, electronic—See Audio	
Rain detector	Apr. 52 62
Tachometer, Rotalyzer	Dec. 52 75
Timer, long-interval	Jan. 52 119
Timer, radio, long-period	Aug. 52 48
Switch, sound-operated	Apr. 52 36

F

### FICTION

Noise Neutralizer	Apr. 52 52
Pedro and the Incentive Plan	Mar. 52 32
The Pest	Jul. 52 42
The Toughest Customer	Jan. 52 44

### FREQUENCY

Divider	Oct. 51 78
Meters—See Measurements	
Spotter, crystal	Jun. 52 51
FREQUENCY MODULATION	
British test results	Feb. 53 49
Receivers	
Gated-beam discriminators, aligning	Oct. 52 72

G

Glow-lamp applications	May 52 82
------------------------	-----------

I

### INDUSTRIAL ELECTRONICS

Flame control	Feb. 52 58
Hammer, electronic	Apr. 52 76
Painting, electrostatic	May 52 66
Precipitator, electrostatic	Jan. 52 121
Precipitators, inexpensive	Aug. 52 35
Recorder, Servograph	Aug. 52 50

INTERCOMS—See Audio

L

LOUDSPEAKERS—See Audio

M

Magnetic phenomena (bismuth wire)	Nov. 51 41
Mathematics, Boolean algebra	Dec. 51 46
In electronic design	Feb. 52 55

### MEASUREMENTS AND METERS

Audio—See Audio	
Capacitance checker	Apr. 52 44
Meters—See also Audio	
Application in home-built instruments	Oct. 51 34
Brightness	Jul. 52 102
Field-strength, television	Dec. 51 92
Frequency, 0-50 kc	Feb. 52 25
Grid-dip	Sep. 52 112
Milliamperes, multirange	Apr. 52 37
Multimeter, electronic	Sep. 52 57

RADIO-ELECTRONICS



**TELEMATIC** THE Professional LINE OF

# CRT EXTENSIONS

MAKES SERVICING EASIER

**Anode EXTENSION**  
CR-32.....3 ft  
CR-33-6....6 ft  
Exclusive Non-Breakable Welded Ends

**Socket EXTENSION**  
CR-35.....3 ft  
CR-35-6....6 ft  
Exclusive One model for both Electromagnetic & Electromagnetic CRT's.

**Yoke EXTENSION**  
CR-55.....3 ft  
CR-55-6....6 ft  
Exclusive Leads pitched For Security

Buy a hit today and save time on your next job. Available in 3 & 6 ft models

**Free!**  
Booklet on TV Interference. Just write.

**TELEMATIC**  
ONE JEROME ST. • BROOKLYN 2, N. Y.

Multitest	Mar. 52 44
Ohm, Edison-effect type	Jun. 52 76
Ohm, open-scale	Oct. 52 124
Volt, r.f., sensitive	Mar. 52 95
V.t.v.m., audio	Oct. 52 74
V.t.v.m. low-cost	Dec. 52 46

<b>MOBILE RADIO</b>	
Base transmitters, remote control of	Nov. 52 86
Equipment, maintenance	Oct. 51 84
Interference suppression in	Sep. 52 62
Maintaining two-way	Mar. 52 46
Servicing two-way	Apr. 52 70
Servicing, universal tester for	Nov. 51 90
V.t.v.m. in	Jan. 52 105
TV service unit	Oct. 51 22
Model control, plane	Jun. 52 48
<b>MUSICAL INSTRUMENTS, ELECTRONIC—</b>	
See Audio	

<b>ORGANS, ELECTRONIC—See Audio</b>	
<b>OSCILLATORS</b>	
Audio—See Audio	
Harmonic, crystal-controlled	Dec. 51 50
Transistor, crystal-controlled	Apr. 52 56
Variable-frequency—See Amateur	
Output meter—See Audio; Meters	

<b>P</b>	
Photodiode, subminiature	Mar. 52 62
<b>POWER SUPPLIES</b>	
14-kv	Dec. 51 62
<b>Regulated</b>	
250-400-volt, 150-ma	Apr. 52 66
300-volt, 200-ma	Aug. 52 72
Vibrator circuits	Oct. 51 56
Voltage regulation	Nov. 51 37
	Aug. 52 47
Of r.f. supply	Sep. 52 84
Production-type tube checker	Aug. 52 32

<b>R</b>	
Radio control, model plane	Jun. 52 48
Reactance	Nov. 52 72
<b>RECEIVERS—See also Amateur</b>	
Fixed-tune broadcast (ROK)	Dec. 52 78
One-tube	Feb. 52 78
Three-tube, superheterodyne	Nov. 51 107
A.g.c. for, suppressor type	Apr. 52 55
Bandspread circuits	Oct. 52 55
Battery, power conservation	Jun. 52 38
Codan circuits for	Feb. 52 32
Communications	Feb. 52 86
B.f.o. trouble in	Jul. 52 41
Variable-selectivity i.f. for	Oct. 51 102
	Mar. 52 83
Crystal	Oct. 52 102
Miniature, superregenerative,	Oct. 51 74
Aircall	
Motorola plated chassis	Dec. 52 44
Pilot light addition to	Oct. 52 70
Push-button tuner for	Jul. 52 52
Regenerative bandswitching	Sep. 52 56
S-meter for	Jun. 52 45
Squelch circuit for	Jan. 52 145
WVV	Jul. 52 58

<b>RECORDERS—See Audio</b>	
Rejuvenator, TV tube—See Tubes	
<b>RELAYS</b>	
Capacitance-operated, for window display	Oct. 51 38
Sensitive	Sep. 52 57
Sound-operated	Mar. 52 97
Resistors, making precision	Oct. 52 122

<b>S</b>	
Schools, selection of	Jul. 52 59
<b>SERVICING</b>	
Bench for	Feb. 52 30
	Mar. 52 49
	Apr. 52 41
With swing-out panel	Oct. 51 39
Business management in	Sep. 52 47
Carrying case for	Dec. 51 38
High-voltage safety in	Oct. 52 38
Instruments for—See Measurements, Test Instruments	
Legal obligations of technicians	Feb. 52 22
	May 52 34

**Columbia**

## The Improved Deluxe TELEVISION Service Light!

Now... with complete swivel for better lighting and easier servicing!

EVERY SERVICEMAN, experimenter, model-maker needs this handy item. No need to work in the dark... ample light is provided by a 7½ watt, 110 volt bulb that remains cool at all times.

Scientifically-designed, unbreakable aluminum reflector directs maximum light to point of work... A REAL TIME AND LABOR SAVER.

Wide opening spring clamp will hold firmly to sides of wherever it is attached to inside of TV cabinet. Rubber covering on clamp prevents scratching or marring of surface. Both hands are free to work with this service aid... HANDIER THAN A FLASHLIGHT.

Carried by leading jobbers!

Have you seen our other TV service aids... "TV Service Cord" and "TV Picture Tube Extension Cable"?

We manufacture cord sets and cables to government and civilian specifications.

**Columbia**

## WIRE & SUPPLY CO.

2850 Irving Park Road • Chicago 18, Ill.

National distributors and warehouse for ANACONDA denseath television and radio wires and cables

# GREYLOCK 1953 CATALOG

AN ESSENTIAL BUYING GUIDE for every RADIO & TV SERVICEMAN!

featuring:

- GREYLOCK TUBES, at new low prices!
- STANDARD BRAND TUBES, tremendous values!
- COMPLETE STOCKS OF STANDARD BRAND LINES

including:

**INSTRUMENTS**

EICO  
Jackson  
EMC  
Oak Ridge

**HARDWARE, TOOLS**

ICA  
Walco  
Jackson Irons  
Phillips Guns  
Xcelite  
Eby  
Mueller

**BOOKS**

Howard Sams  
Rider  
Coyne  
Editors & Engineers

**RADIOS, SOUND EQUIPMENT**

Pentron  
Bogen Challenger  
Atlas Sound  
Steelman Phones  
Gen'l Industries  
Esquire Clock Radios

**OTHER TOP BRANDS**

C.D. Vibrators, Converters,  
Antenna Rotators  
Merit Transformers  
Sprague Condensers  
Stanwyck Coils  
GE Lamps  
Recaton Needles  
Shure Microphones  
RMS Antennas, Accessories  
Electrovoice  
Burgess Batteries  
Quam-Nichols Speakers  
Regency Boosters

**GREYLOCK** ELECTRONICS SUPPLY CO.  
115 Liberty St., N. Y. 6  
Phone BE. 3-0224

GREYLOCK ELECTRONICS, Dept. C-1  
115 Liberty St., N. Y. 6

Send FREE Catalog #200 at once to

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_



## Amazing Performance!

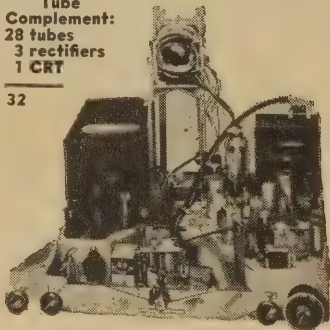
## MATTISON

SILVER ROCKET 630 CHASSIS

• with TUNEABLE •

BUILT-IN BOOSTER  
for Better DX ReceptionFeaturing NEW CASCODE TUNER  
made for UHF interchangeable  
tuning strips and 70° COSINE YOKETube  
Complement:  
28 tubes  
3 rectifiers  
1 CRT

32



## All Channel Booster

- Broad band single knob control pre-amplifier built in to eliminate long leads which may cause regeneration and attenuation of signal.

- ONLY THE MATTISON 630 CHASSIS HAS AN ALL CHANNEL TUNEABLE BUILT-IN BOOSTER THAT INCREASES SIGNAL STRENGTH UP TO 10 TIMES. THE SILVER ROCKET WILL OUTPERFORM ANY CHASSIS MADE AND IS PRICED RIGHT TO SELL FAST WITH AN EXTRAORDINARY MARGIN OF PROFIT FOR YOU. WRITE FOR CONFIDENTIAL PRICE SCHEDULE.

- Mattison features a complete line of cabinets MADE IN MATTISON'S OWN CABINET FACTORY. 36 breathtaking designs that blend perfectly in any setting, traditional or modern.

ALL  
CABINETS  
MADE IN  
MATTISON'S  
OWN  
CABINET  
FACTORY!



## The BERKSHIRE 21"

Genuine Mahogany. Deeply paneled 1½" thick doors. Crotch Mahogany design and Hi-light shading throughout. Illuminated channel selector. Chassis is side mounted. Dimensions: height 40", width 32½", depth 23½".

**DEALERS! SERVICE DEALERS!** Here is your opportunity to become the "important" TV Dealer in your area for THE FINEST CUSTOM-BUILT LINE OF TV RECEIVERS. FREE!! Write for Mattison's merchandising portfolio, explaining the "UNASSEMBLED PLAN" and "\$1,000,000 FLOOR PLAN."



Manufactured with integrity

**Mattison Television & Radio Corp.**  
10 West 181st St., Dept. RE, N. Y. 53, N.Y.

When you buy from Mattison you need only one source of supply! You can buy a Mattison Chassis, a Mattison Cabinet or a complete Mattison TV Set!

Mobile equipment—See Mobile  
Nuisance call elimination Oct. 52 40

## Receivers

Auto radios May 52 47  
Dummy antenna for Jun. 52 35  
Gated-beam discriminators Oct. 52 72  
in  
Load meter use Jul. 52 35  
Midget Mar. 52 92  
Old, rejuvenation of Jul. 52 40  
Pilot light servicing Dec. 51 40  
Oscillators Oct. 52 70  
Squeals Mar. 52 43  
Tuning wand use Sep. 52 46  
Rolling table for Sep. 52 43  
Service-aid instrument May 52 52  
Small shop advantages Mar. 52 28  
Speaker, universal Aug. 52 34  
Substitution box for Oct. 52 49  
Aug. 52 33

## Television receivers

Control troubles Mar. 52 30  
Brightness Apr. 52 48  
Diagnosis of picture faults Jul. 52 30  
Fix-it books Mar. 52 51  
Flyback squeal Jul. 52 28  
Hard-to-find troubles Jun. 52 28  
High-voltage circuits May 52 42  
Horizontal locks Jan. 52 50  
In customer's home Mar. 52 48  
Intercarrier buzz elimination Oct. 51 24  
Mobile shop Oct. 51 22  
Picture tube replacement Jan. 52 58  
chart  
TV receiver as signal tracer Nov. 52 44  
Vertical sync instability Oct. 51 30  
With simple instruments Apr. 52 38  
May 52 48  
Feb. 52 28

Wheelchair shop

SIGNAL GENERATORS—See Test  
Instruments; Audio

## T

TAPE RECORDERS—See Audio  
TELEVISION

## Antennas—See also Antennas

Balancer for Nov. 52 48  
V.h.f.—u.h.f. Oct. 52 84  
Coupler, multi-antenna Sep. 52 54  
Design formulas Jun. 52 82  
Installation, indoor antennas Feb. 52 37  
Manufacturer directory Jan. 52 60  
Safe installation of Jan. 52 116  
Jun. 52 34  
Jan. 52 47  
Jan. 52 54  
Sep. 52 42  
Jan. 52 34  
Sep. 52 66

## Boosters

Chain amplifier Feb. 52 62  
Commercial model list Jan. 52 62  
Single-channel, low-band Aug. 52 25  
Circuits, new 1952 Jan. 52 30  
For fringe reception Apr. 52 46  
Dx, 1951 summary Jan. 52 40  
Eidophor system Oct. 52 34  
Eyestrain reduction Sep. 52 32  
Ghost analysis Apr. 52 45  
Interference Jul. 52 34  
Filter for May 52 44  
I.f. Feb. 52 40  
From police transmitters Oct. 51 29  
Military instruction with Jan. 52 43  
Motion-picture theater use Mar. 52 22  
Network map Jan. 52 28  
Prospects Jan. 52 26  
May 52 30

## Receivers

630-type  
Sound improvement in Dec. 51 43  
Screen size increase Jan. 52 56  
Appearance improvement Jun. 52 26  
Color  
CBS-Columbia Nov. 51 24  
Conversion to Oct. 51 26

**The WISE**

**buy SKYLINE!**

- ★ 28 fewer element connections
- ★ 8 integral elements VS. 40
- ★ Pre-assembled—Quick rigtime
- ★ Extra heavy—all aluminum
- ★ Amazing reception to 150 miles

The Skyline foldable colinear antenna possesses higher gain with respect to signal strength because the elements are integral!

No loss of signal strength through a multiplicity of mechanical connections.

Only the Skyline continues to maintain high gain in relation to signal strength over an indefinite period of time.

The Skyline colinear antenna, with its new engineering developments, is fast replacing all other types in fringe areas.

SEE YOUR LOCAL DEALER FOR MORE INFORMATION

**SKYLINE MFG. CO.**  
1458C4 East 17th Street  
Cleveland 14, Ohio

## TELEVISION

## Big demand for graduates

**B.S. DEGREE IN 27 MONTHS** in radio including TV engineering—VHF, UHF, AM and FM. Students use over \$100,000 worth of equipment including 2 large commercial type transmitters in new TV lab. Intense specialized course includes strong basis in mathematics, science and advanced design in radio and TV.

Hundreds of young men each year are earning engineering degrees in this recognized institution. Start any quarter. Many earn a major part of expenses in this industrial center. Low tuition. Competent instruction. Thorough, intense, practical program.

Also **B.S. DEGREE IN 27 MO.** in Aeronautical, Chemical, Civil, Electrical and Mechanical Engineering. G.I. Gov't approved. Enter March, June, Sept., Dec. Free catalog. **ENROLL NOW**

**INDIANA TECHNICAL COLLEGE**  
1713 E. Washington Blvd., Fort Wayne 2, Indiana

RADIO-ELECTRONICS



	DATE	PAGE
Commercial model directory	Jan. 52	65
Fringe-area performance of	Jan. 52	48
I.f. amplifiers, 44-mc	Jan. 52	38
Ion burns on picture tubes	Feb. 52	34
Power supply, conversion to flyback	Oct. 52	33
RCA 9T-270, screen size increase	May 52	36
Remote controls for	Nov. 51	28
Retrace blanking in	Sep. 52	38
Sales, home trials	Aug. 52	22
Screen size increase	Mar. 52	24
	Aug. 52	26
	Sep. 52	34

#### Servicing—See Servicing

U.h.f. Converters

Oct. 52 30

Dec. 52 36

Jan. 52 36

U.h.f. Reception

#### Studios

Equipment operation

Feb. 52 52

Mar. 52 54

#### TEST EQUIPMENT—See also Meters, Audio

Battery instruments, monitoring

Jun. 52 38

Crosshatch generator,

Nov. 52 52

Telepocket

Frequency spotter, crystal

Jun. 52 51

Multitube checker

Aug. 52 32

Picture tube analyzer

Oct. 52 36

Probe, compensated, for 'scope

Oct. 51 106

Service combination instrument

Mar. 52 28

Jul. 52 36

May 52 53

#### Signal generators (audio—See Audio)

Multi-unit

Jan. 52 98

Multivibrator type

Oct. 51 32

Signal tracer, dynamic

Jun. 52 40

Synchroscope conversion

Oct. 52 124

Tester for mobile use

Nov. 51 90

#### THEORY

Electronic flame

Dec. 52 42

Filter design

Nov. 51 54

Reactance

Nov. 52 72

Rectification with translator

Jul. 52 61

Circuits

Transmission lines

A.c., simplified

Oct. 52 76

Audio, constant-voltage

Feb. 52 44

Tuned circuits, resistance-adjusted

May 52 61

#### AUDIO TRANSFORMERS

Variable line, uses

Apr. 52 54

#### TRANSISTORS

Amplifier circuits

Dec. 51 56

Circuit design

Oct. 51 64

Future of

Jul. 52 26

Oscillators, crystal-controlled

Apr. 52 56

Sawtooth oscillator

Nov. 52 50

#### TRANSMITTERS—See also Amateur

150-kw, Davenport

Mar. 52 58

Marine, crystal-controlled

Nov. 51 11

Remote control for

Nov. 52 86

#### TUBES

2050

May 52 64

6BN6, circuits for

Dec. 51 37

Cathode-ray

Checker

Oct. 52 36

Ion burns in

Feb. 52 34

Reactivators, rejuvenators, testers

Sep. 52 28

Replacement guide

Jan. 52 48

Tube checker for 10 tubes

Aug. 52 32

Replacement and substitution

Oct. 51 36

Thyratron, battery-operated

Sep. 52 80

#### TVI—See Television interference

#### U

#### ULTRASONICS

Bird removal by

Nov. 51 52

Medical applications

Nov. 51 46

Correspondence on

Feb. 52 123

#### V

Vibrators—See Power supplies

Volume expanders—See Audio

Voltage regulators—See Power supplies

#### W

Wire table use

Jan. 52 117

END

sorry, Sherlock...  
case is closed!

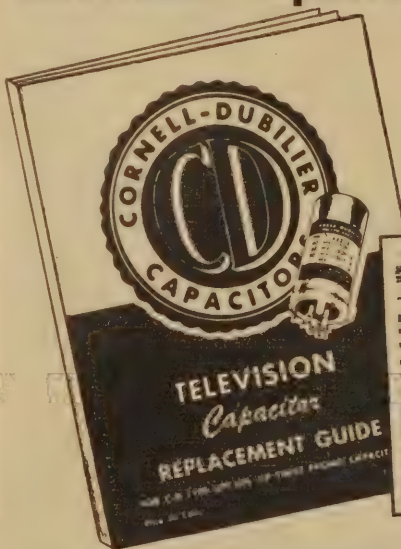


C-D has solved TV  
electrolytic replacement  
problems with  
their new

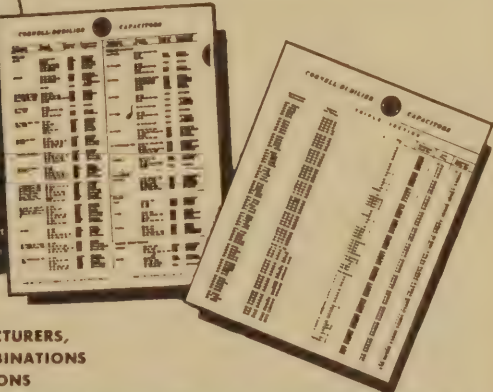


FREE

## television capacitor replacement guide



Just off the press! Do you have your copy?  
Available only at your local Cornell-Dubilier  
authorized jobber. For one nearest to you see  
your local classified telephone directory, or  
write to Dept. RC13, Jobber Division, Cornell-  
Dubilier Electric Corporation, So. Plainfield, N.J.



listing 1,192 MODELS, 76 MANUFACTURERS,  
390 CAPACITORS AND COMBINATIONS  
431 CAPACITOR SPECIFICATIONS



OTHER PLANTS IN NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE, R. I.;  
INDIANAPOLIS, IND.; FUGUAY SPRINGS, N. C. SUBSIDIARY, THE RADIANT CORP., CLEVELAND, O.

### ON-THE SPOT BATTERY RECORDER

WALKIE-RECORJALL 8 lb. miniature BATTERY  
RECORDER-PLAYBACK  
Continuous, permanent, accurate, indexed recording  
at only 5c per hr. Instantaneous, permanent play-  
back. Picks up sound up to 60 ft. Records confer-  
ences, lectures, dictation, 2-way phone & sales talks;  
while walking, riding or flying. Records in closed  
briefcase with "hidden mike"! Write for details.

MILES REPRODUCER CO., INC.  
812 BROADWAY Dept. RE-1 NEW YORK 3, N. Y.

### TRAIN AT HOME ELECTRONIC DRAFTSMAN

Many Electronic Draftsmen needed im-  
mediately by defense agencies and con-  
tractors. Excellent pay. Pioneer radio engi-  
neer offers an original and exceptionally  
high class correspondence course to qual-  
ified ambitious young men and women.  
Details free.

CHARLES ROLAND LEUTZ  
P.O. Box 368, Silver Spring, Maryland

### Every RADIOMAN can use these SERVICE HINTS!

Valuable Manual Yours—FREE  
Write today, no obligation.

FEILER ENGINEERING CO., Dept. 1RC3-1  
8026 N. Monticello Ave., Skokie, Ill. (Suburb of Chicago)

Every page of  
"How to Sim-  
plify Radio Re-  
pairs" is pack-  
ed with on-the-  
bench, practical  
ideas.



## meet 85% of your replacement needs with these TRIAD Television Components

There are 23 Triad Television Replacement items listed below. They will take care of 85% of your service needs. Always keep a supply on hand. They eliminate excessive inventories, speed servicing and simplify reordering. Your Triad jobber carries them in stock. Call him today.



Y-12

## DEFLECTION YOKES:

Y-11	Y-19
Y-12	Y-20
Y-17	



TYPE P

HORIZONTAL OUTPUTS:  
(Flybacks)

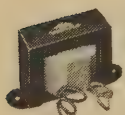
D-1	D-15
D-11	DA-20
D-14	



CASE Y

VERTICAL BLOCKING  
OSCILLATORS:

A-97X	A-97Y
A-97K	



CASE X

## FILTER CHOKES:

C-11X	C-21X
C-13X	C-23X
C-17X	

## VERTICAL OUTPUTS:

A-99X	A-103X
A-101U	A-107X
A-102X	

Write for Catalogs TR-52B and TV-52B



4055 Redwood Ave., Venice, California



THE FUND TOPS \$10,000

## HELP - FREDDIE-WALK FUND

We continue to receive encouraging reports from Herschel Thomason, radio technician of Magnolia, Arkansas, on the progress of his four-year-old son, Freddie, who, as most of our readers know, was born without arms or legs. Freddie's courage and patience seem unending, and his father's latest letter tells us that he "is walking better every day, although he still needs a little help for his forward motion. We feel sure that when his legs are readjusted he will be able to walk over any level surface by himself."

And there, in the word "readjusted," we have the crux of the matter—the main concern of the Help-Freddie-Walk Fund. For not only will Freddie be always dependent upon mechanical devices for the simplest acts that we more fortunate ones take so for granted, but for many, many years these appliances will have to be constantly adjusted and readjusted to meet Freddie's growing needs.

Although the Fund has reached a grand total of over \$10,000, many more thousands of dollars will be needed before we can consider our job well-done. We are most appreciative of the enthusiastic response from our readers during the past three years, and ask only that it be continued. At this time we would like to make special mention of a contribution of \$2.00 received from the Signal Corps Inspection Office, Hi-Q Division, Aerovox Corp., Olean, New York.

We urge each and every reader to "start the New Year right" by sending in a contribution—large or small—to this worthy cause. *Make all checks, money orders, etc., payable to Herschel Thomason.* Address all letters to

**HELP-FREDDIE-WALK FUND**  
c/o RADIO-ELECTRONICS Magazine  
25 West Broadway  
New York 7, New York

### FAMILY CIRCLE CONTRIBUTIONS

Balance as of October 20, 1952 ... \$ 571.50  
FAMILY CIRCLE Contributions as of  
November 17, 1952 ... \$ 571.50

### RADIO-ELECTRONICS CONTRIBUTIONS

Balance as of October 20, 1952 ... \$9,571.47  
Anonymous, Cambridge, Mass. .... 1.00  
Arthur Chretien, Methuen, Mass. .... 1.00  
Joseph T. Corrigan, New York, N. Y. .... 5.00  
Vernon C. DeWerff, Morrisonville, Illinois .... 5.00  
Alvin J. Jacobson, Williston, N. Dakota .... 2.00  
Mr. & Mrs. Thos. F. Maloney, Arlington, Virginia .... 3.00  
Clodovaldo Rossetto, Sao Paulo, Brazil .... 1.00  
Signal Corps Inspection Office, Hi-Q Division, Aerovox Corp., Olean, New York .... 2.00

RADIO-ELECTRONICS Contributions  
as of November 17, 1952 ... \$9,591.47  
FAMILY CIRCLE Contributions ... 571.50  
TOTAL CONTRIBUTIONS as of November 17, 1952 ... \$10,162.97

## PLATT BEST BUYS!

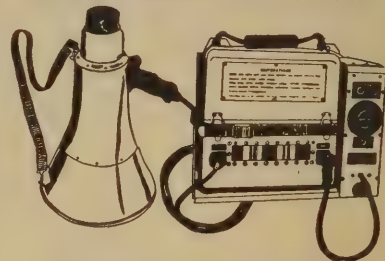
### WELL KNOWN MAKE VTVM



4 1/2" meter with adjustable pointer to zero center for TV & FM discriminator alignment. AC-DC Ranges: 0-5/10/100/500/1000 V. 5 Resistance Ranges: 2 ohms-1000 megohms. DB scale for audio and gain measurements. Completely wired & tested—ready for use—SPECIAL WHILE THEY LAST! ... \$34.95

TUBES	BRAND NEW! JANI BOXED!	TUBES
1B22 .... 69c	100R .... 49c	864 .... 19c
1B23 .... \$3.75	114B .... 29c	954 .... 13c
2B22 .... 49c	215A .... 09c	1616 .... 49c
2C22 .... 14c	221A .... 29c	1618 .... 19c
2C26 .... 09c	304TH .... \$5.95	1625 .... 29c
2C26A .... 09c	316A .... 29c	1626 .... 19c
3B22 .... \$1.19	371B .... 29c	1627 .... 22c
3C24 .... 98c	388A .... 59c	7193 .... 19c
3D6 .... 39c	471A .... \$1.19	9002 .... 69c
3D7 .... \$1.79	531A .... \$1.19	9006 .... 19c
7C4 .... 39c	722A .... 99c	E1148 .... 49c
10Y .... 19c	801A .... 19c	RK34 .... 99c
12KSY .... 39c	826 .... 39c	VR92 .... 14c
15R .... 39c	841 .... 29c	VT127 .... 15c
39/44 .... 29c	843 .... 17c	

### ELECTRIC MEGAPHONE SYSTEM



For Rural Areas, Hotels, Commercial Steamers, Ball Parks, Etc.

U. S. NAVY Type PAE-1 Electric Megaphone equipment is designed for voice reinforcement in much the same manner as, but to a greater degree than, the familiar acoustic megaphone. Consists of Megaphone Unit (which combines a microphone and reproducer in a single assembly), Portable Amplifier which electrically amplifies the output signal of the microphone section of the megaphone and feeds this amplified signal to the reproducer section. Charging Rack for recharging the self-contained storage battery of the portable amplifier. **BRAND NEW—A TREMENDOUS VALUE! DEMONSTRATION GIVEN AT EITHER OF \$149.50**



SCR-274N  
COMMAND  
and  
ARC-5  
EQUIPMENT



RECEIVERS	EXCELLENT USED USED NEW
BC-453—190 to 550 KC .....	\$22.95 \$49.95
BC-454—3 to 6 MC .....	\$12.95 19.95
BC-455—6 to 9 MC .....	9.95 11.95 16.95
TRANSMITTERS	
A-958—2.1 to 3 MC .....	29.95
BC-458—5.3 to 7 MC .....	7.95 9.95 17.95
ARC-5-T-19—3 to 4 MC .....	24.95 34.95
BC-459—7 to 9.1 MC .....	24.95
T-15 ARC 5—500 to 800 KC .....	29.95

ADDITIONAL EQUIPMENT	
BC-450 Control Box (3 Receivers) .....	2.49 2.95 5.95
BC-451 Control Box (Transmitter) .....	1.49 1.95 2.75
BC-442 Relay Unit (ANT) .....	1.29 1.79 2.39
Plugs: PL-147, 148, 151, 152, 153, 154, 156—EACH .....	2.39 2.89 3.69
Flexible Shafting with gear to fit receivers .....	1.25
3 Receiver Rack .....	1.79 2.29 2.98
2 Transmitter Rack .....	1.69 2.39 3.97
Single Transmitter Rack .....	3.97
DM-32 Dynamotor for Command Set .....	3.95 5.95
DM-33 Dynamotor for Command Set .....	2.95 3.95
Mounts for 2 Trans. Rack, 3 Rec. Rack, Modulator, & Antenna Relay Unit .....	1.95

### LIMITED QUANTITY

COMMAND SET BC-455—6 to 9.1 MC. Excellent, 95% completely wired—a few minor parts included require assembling. Instructions included. **ONLY \$6.95**

COMMAND TRANSMITTER—Navy and Army type—3 to 4 MC, 75% complete spare parts—LIMITED QUANTITY ... **\$8.95**

### HEADSETS

HS-33 low impedance with cord and plug, used, fine condition .....	\$2.79
HS-23 high impedance, BRAND NEW with ear pads, cord .....	4.95
HS-33 low impedance, BRAND NEW with ear pads, cord and PL54 plug .....	\$5.39
HS-33—BRAND NEW—Western Electric .....	5.95
CD-307A Cords, 6 ft. NEW .....	.89
H-16/U high impedance. Includes two receiving units .....	3.95
HS-16 high impedance—used .....	2.49

### MINIMUM ORDER \$2.00

Immediate Delivery—send 25% deposit on C.O.D. orders. All shipments F.O.B., N.Y.C. (N.Y.C. residents add sales tax to your remittance.)

### PLATT ELECTRONICS CORP.

Dept. B, 489 Broome St., N. Y. 13, N. Y.  
PHONES: WO 4-0827 and WO 4-0828  
BRANCH STORE: 159 Greenwich St., N.Y.C.



## REMOTE-CONTROL PROBLEM

Dear Editor:

In reply to Mr. Waelder's switching problem in the October issue of RADIO-ELECTRONICS, one solution is to mount chassis type a.c. outlets on the back of the tuner or control amplifier, and add an extra deck to the input-selector switch to feed 117-volt a.c. to each unit in the corresponding switch position. The extra deck should be well separated or shielded from the audio-input deck to minimize 60-cycle hum pickup. (The switch contacts must be heavy enough to carry the required a.c. loads.—Editor)

I have used this system for a year and a half in a home-built radio-phono combination and it has given good results.

LEON CARTER

North Charleston, S. C.

(Mr. Waelder asked for suggestions on automatically turning on and off a.c. power to various units (such as a phono turntable and preamplifier, separate AM and FM tuners, or a tape recorder), from an audio-control unit that has only a signal-input selector switch.—Editor)

## CRYSTAL-SET DX

Dear Editor:

The article about the super-dx crystal set in the October RADIO-ELECTRONICS started me trying for a little dx myself. I didn't get around to trying the set described but I hooked up the circuit shown in the diagram on a breadboard, and lacking a regular antenna, used a 75 foot length of 300-ohm ribbon line.



The first antenna coil I tried just didn't have the pep, so I wound one with No. 20 hookup wire and sat down to listen. Very faintly, I logged four stations between 7:30 and 8:00 pm. This was Oct. 16.

Still not satisfied, I tried half a dozen different coils—commercial and home made—with indifferent results until I happened to think about a battered loopstick that I had thrown on the shelf.

That was the answer—at least for dx. On October 18th, I picked up the following stations between 7:00 and 10:00 p.m., with unusual volume.

WLW—Cincinnati	WCFL—Chicago
WWVA—Wheeling	WENR—Chicago
KDKA—Pittsburgh	CBL—Toronto
KYW—Philadelphia	WGR—Buffalo
WGN—Chicago	WBZ—Boston
WMAQ—Chicago	

Toronto and Buffalo were both loud enough so that speech was understandable through a magnetic speaker.

I have listened to Toronto, Buffalo, and WBZ (Boston) with good head-phone volume at all hours of the day the past two days. (I work nights!)

FRANCIS E. DE GROAT

Salamanca, N. Y.

JANUARY, 1953

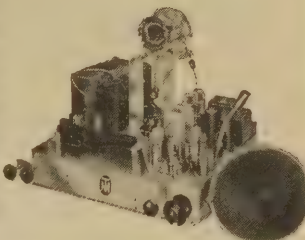
More Leading  
ENGINEERS and  
TECHNICIANS  
Choose

# TECH-MASTER TV KITS

C. G. McProud, Editor of AUDIO Engineering, writes, "... I was amazed with the speed and simplicity ... friends marvelled at the picture quality ..."

## TECH-MASTER Advanced 630-Type Circuit

World's Finest TV Kit—For all tubes from 16" to 24" • Advanced standard TURRET TUNER, adaptable to U.H.F. without tools • Cascode R.F. amplifier stage • Keyed AGC circuit • Full 4 Mc band width • "Hi-Sweep" voltage multiplier system • 3-stage synchronized amplifier • 3-stage video amplifier. Model 630D24-Deluxe, (all principal components mounted) .....\$159.50 Model 630S24-Standard, (unassembled) \$154.50 Complete with all components, picture tube mounting brackets, speaker and all tubes (less Kine, wire and solder) .....\$99.95



## TECH-MASTER Universal AC/DC KIT

High quality TV now within reach of all. Advanced 12-channel TURRET TUNER adaptable to U.H.F. without tools • Latest type hi-gain stagger-tuned IF system in Tech-Master exclusive pre-wired Synchro-Strip • New AGC system • Maximum signal amplification, even in fringe areas • For 14" and 17" rect. tubes. Model 5116: Complete with set of 16 circuit tested tubes, hardware, instructions and picture tube mounting brackets, (less Kine, wire and solder) .....\$99.95



Sold by all leading Radio Parts Distributors.

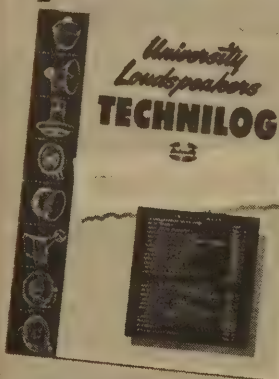


Write for  
literature.

# TECH-MASTER PRODUCTS COMPANY

443-445 BROADWAY, NEW YORK 13, N. Y.

This **TECHNICAL INDEX** is one reason  
you need this 28-page volume!



Not just a catalog!

Includes both technical and product data in factual, concise form with dozens of helpful explanatory photographs, charts and tables. Features much engineering information available NO-WHERE ELSE!

IT'S THE **University**  
**TECHNILOG**

The new 1952 compilation of valuable information that explains and simplifies the application of loudspeakers. A real time and money saver for dealers, contractors, service men and installation designers. The most authoritative, single piece of literature ever published on loudspeakers. It's yours FREE.

TECHNICAL INDEX	
SELECTING THE PROPER LOUDSPEAKER SYSTEM .....	Page 4
METHODS OF CONNECTING SPEAKERS TO THE AMPLIFIER .....	Page 8
IMPEDANCE MATCHING .....	Page 9
CONSTANT VOLTAGE DISTRIBUTION SYSTEM .....	Page 12
IMPEDANCE MATCHING TRANSFORMERS .....	Page 16
EFFECTS OF MISMATCH UPON POWER TRANSFER .....	Page 16
CONTROLLING LOUDSPEAKER VOLUME .....	Page 20
OVERLOAD PROTECTION OF LOUDSPEAKERS .....	Page 22
PHASING LOUDSPEAKERS .....	Page 23
REVERBERATION .....	Page 23
BAFFLING A CONE SPEAKER .....	Page 26
ADDRESS REQUESTS TO YOUR DISTRIBUTOR	

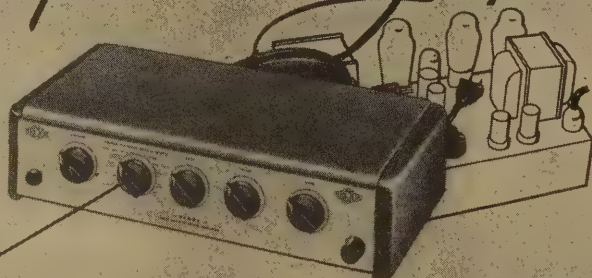


**UNIVERSITY LOUDSPEAKERS • INC**  
80 SO. KENSICO AVE., WHITE PLAINS, NEW YORK



## THE AUDIO PERFORMANCE OF

*New* **BROOK** ALL TRIODE HIGH QUALITY  
AUDIO AMPLIFIERS  
IS BEYOND DESCRIPTION  
*Let your Ears Pass Judgment*



- Nine distinct positions for record playback provide complete bass and treble equalization for best-known recordings.
- Bass effective to 15 cycles results in improved transient response that makes all bass tones sound more natural.

Write for complete technical data, and be sure to listen to the new BROOK at your local dealer's Sound Department.

**BROOK ELECTRONICS, INC.**

34 DeHART PLACE, ELIZABETH 2, N.J.

Dept. EA-3

## FOR THE BEST COVERAGE

IT'S THE NEW SECOND EDITION

## BETTER TV RECEPTION

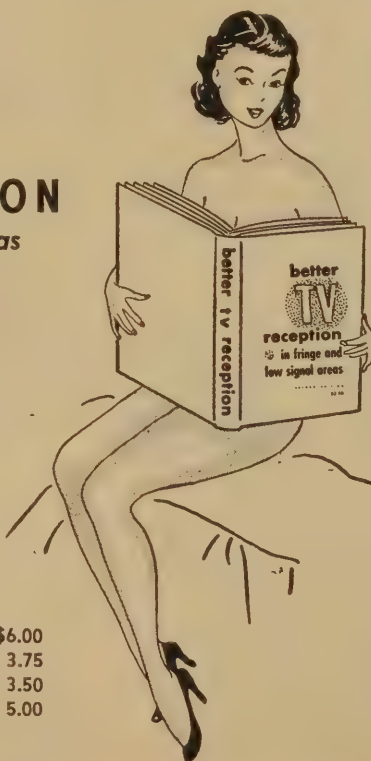
*In fringe and low-signal areas*

Here's the book which has taken the failure out of many unsuccessful fringe area installations, and has improved the picture for many discouraged TV owners. Practical and easy to understand. How to reduce interference, minimize fading, eliminate "ghosts." How to choose the best boosters and receivers, transmission lines and antennas.

**\$2.50** per copy (plus any tax)

### FOR ADDITIONAL COVERAGE:

RADIO HANDBOOK, 13th edition .....	\$6.00
RADIOTELEPHONE LICENSE MANUAL ...	3.75
ANTENNA MANUAL .....	3.50
WORLD'S RADIO TUBES (Vade Mecum) ..	5.00
SURPLUS RADIO CONVERSION MANUAL	
in 2 volumes	
Each volume .....	2.50



## BUY FROM YOUR DISTRIBUTOR

AT PRICES SHOWN, OR ADD 10% ON DIRECT MAIL ORDERS TO  
EDITORS and ENGINEERS, Ltd., 1305 KENWOOD ROAD, SANTA BARBARA, CALIF.  
Bookstores order from BAKER AND TAYLOR CO., Hillside, New Jersey

**ELECTRICAL FUNDAMENTALS OF COMMUNICATION**, Second Edition, by Arthur L. Albert. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 6 x 9 inches, 531 pages. Price \$7.00.

This is a beginner's book in communication. It is clearly written and well illustrated. Interest is maintained by many numerical examples worked out in detail. Chapter summaries, review questions, and problems are provided at the end of each chapter.

The book starts with elementary principles of d.c. and a.c. Resistive, inductive, and capacitive circuits are analyzed and solved numerically. One chapter deals with measuring instruments of the d.c. and a.c. type.

More advanced material appears in the last half of the book. Impedance relationships, network theorems, transmission lines, and propagation are among the subjects discussed. One chapter is devoted to vectors and how to use them. This subject often proves difficult to nonmathematical readers, but it is clearly described here. Filter networks and bridge circuits are briefly covered.

The last few chapters discuss tube and crystal circuits, including oscillators, amplifiers, and rectifiers. The final chapter is on acoustics.

A five-place table of trigonometry functions appears in the appendix.—IQ

**BASIC MATHEMATICS FOR ENGINEERING AND SCIENCE** by Walter R. van Voorhis and Elmer E. Haskins. Published by Prentice-Hall, Inc., New York, N. Y. 5½ x 8¼ inches, 619 pages. Price \$7.65.

This book is additional proof that mathematics can be interesting as well as useful. It is written clearly and covers ground essential to the pre-calculus student. Algebra, analytic geometry, and trigonometry are skillfully combined, not relegated to separate parts of the book. This unifies the subject of mathematics and makes it less terrifying.

At the beginning, symbols and functions are introduced to the future engineer and scientist. Following chapters describe linear, quadratic, and polynomial functions. Then the reader discovers the utility of exponents, logarithms, trigonometric functions. Each subject is tied in with practical illustrations and applications. The appendix lists useful tables for reference.

Exercises appear throughout the book, and answers are provided at the back of the book. This feature makes it as suitable for self-study as it is for formal classroom work.—IQ

**U.H.F. PRACTICES AND PRINCIPLES**, by Allen Lytel. Published by John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y. 5¼ x 8¼ inches, 390 pages. Price \$6.60.

This is an easy and logical introduction to modern high-frequency work for the technician who understands lower frequencies. The explanations are clear and little math is employed. First, the book shows how h.f. differs from



# Radio School Directory

## Unlimited Opportunities in RADIO ENGINEERING

### DEGREE IN 27 MONTHS

Complete Radio Engineering course including telev., U. H. F. and F. M. Bachelor of Science Degree also in Mech., Civil, Elect., Chem., and Aero. Eng.; Bus. Adm., Acct. Extensive campus, modern buildings, well equipped labs. Low cost. Prep courses. Personalized, practical instruction. Founded 1893. Placement service. Growing shortage of engineers. Prepare now, approved for Korean vets. Enter January, March, June, September. Write for catalog.



### TRI-STATE COLLEGE

2413 College Ave. ANGOLA, IND.

### GET INTO TV SERVICING

Send for FREE 24-page illustrated booklet which tells you How to Become A Successful TV Technician. America's Leading TV Servicing School offers you a specialized training program that omits non-essential math & design theory. You concentrate on radio & TV servicing only. You get professional training & experience right in our fully-equipped shops & laboratories. Send for this booklet today. Write Dept. E-12. No obligation—no salesman will call.

APPROVED FOR VETERANS

**WESTERN TELEVISION INSTITUTE**  
341 W. 18th St., Los Angeles 15, Calif.

### PLEASE MENTION RADIO-ELECTRONICS

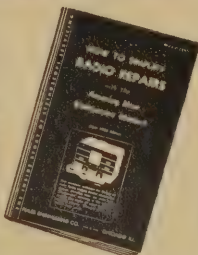
When Answering Advertisements



## EVERY RADIOMAN Can Use These SERVICE HINTS!

Valuable Manual Yours—FREE!

Every page of "How to Simplify Radio Repairs" is packed with on-the-bench, practical ideas. Contains photos, charts, diagrams—no fluff—no vague theory. In plain every-day language it gives you priceless suggestions—new servicing ideas. You'll use and benefit from the experience of experts. Partial list of contents: How to Localize Trouble; How to Service Amplifiers; How to Test for Distortion; How to Test Audio Circuits; How to Test Speakers; How to Find Faults in Oscillators; How to Test Radio Parts—and it's all yours—FREE! No obligation.



**FEILER**

SEND COUPON OR GOVERNMENT POSTCARD FOR YOUR FREE COPY TODAY!

FEILER ENGINEERING CO., Dept. 1RC3  
8026 N. Monticello Ave.,  
Sukokie, Ill. (Suburb of Chicago)

Please RUSH my FREE copy of "How to Simplify Radio Repairs."

Name.....

Address.....

City.....Zone.....State.....

## GET INTO ELECTRONICS

You can enter this uncrowded, interesting field. Defense expansion, new developments demand trained specialists. Study all phases radio & electronics theory and practice: TV; FM; broadcasting; servicing; aviation, marine, police radio. 18-month course. Graduates in demand by major companies, U.S. or equivalent required. Begin Jan., March, June, Sept. Campus life. Write for catalog.  
**VALPARAISO TECHNICAL INSTITUTE**  
Dept. C Valparaiso, Ind.



### RADIO AND TELEVISION ELECTRONICS

in all Technical Phases  
New Classes (Day & Evening)  
Start 1st of Dec., Mar., June, Sept.  
FREE PLACEMENT SERVICE  
for GRADUATES

For Free Catalog write Dept. RC-53  
**RCA INSTITUTES, INC.**  
A Service of Radio Corporation of America  
350 West 4th St., New York 14, N. Y.

### RADIO ENGINEERING 27 MONTHS DEGREE IN 27 MONTHS

Intensive, specialized course including strong basis in mathematics and electrical engineering, advanced radio theory and design, television. Modern lab. Low tuition. Self-help opportunities. Also B.S. degree in 27 months in Aeronautical, Chemical, Civil, Electrical, and Mechanical Engineering. G.I. Gov't approved. Enter March, June, September, December. Catalog.

**INDIANA TECHNICAL COLLEGE**  
151 E. Washington Blvd., Fort Wayne 2, Indiana

### FOR THE FIRST TIME!

For several years you've read about the Don Martin School now—for the first time—we are prepared to offer a course by mail. You can obtain your first class radio telephone operator's license from this special course. Operators are desperately needed now by radio and TV stations as well as the aircraft industry. Secure your future.

Be certain that your training is of the best, enjoy the school recognized by the profession. Write today for full information.

### THE DON MARTIN SCHOOL OF RADIO AND TELEVISION ARTS AND SCIENCES

Correspondence Section  
1655 No. Cherokee, Hollywood 28, Calif. HU. 2-3281.

### RADIO COURSES

• RADIO OPERATING • CODE  
• RADIO SERVICING • ELECTRONICS  
• F.M. TELEVISION

Preparation for Civilian, Maritime, Army and Navy license requirements.

Write for Catalog TE

**TRADE & TECH. SCHOOL** 15 W. 63 St., N. Y. 23  
Endicott 2-8117

### LEARN TELEVISION

ELECTRONICS and RADIO  
Engineering Laboratory and Classroom  
Training, Day and Evening Classes.  
Write for Illustrated Catalog

**ELECTRONICS INSTITUTE, Inc.**  
21 HENRY, DETROIT 1, MICH.

## Become an ELECTRICAL ENGINEER in 36 MONTHS

Bachelor of Science Degree — Major in Electronics or Power

It is estimated by 1955 there will be at least two positions for every engineering and technician graduate. This college offers a tested plan that permits you to enter these vast employment opportunities at an early date. Save a valuable year through optional year-round study. Receive advanced credit for prior training gained in the armed forces, other schools or field experience.

ENTER BOTH RADIO AND TELEVISION 12 months or one-third of the B. S. degree course (Electronics major)—also brings you the Radio Technician's certificate. An added 6-month course qualifies you for the Radio-TV Technician's certificate. Recent developments open unlimited opportunities for TV technicians and engineers.

THE PROVEN "UNIT CHASSIS SYSTEM" of teaching was developed here. It "breaks down" the TV set by stages. You learn every component of all types and makes—and are prepared for future design changes, including the advent of color.

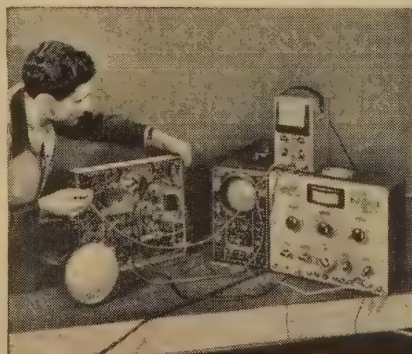
6 TO 12-MONTH TELEVISION SERVICE COURSE... trains for good servicing jobs and shop ownership in the shortest practical time under expert instructors.

Terms open April, July, October, January. Over 48,000 former students from all states and 23 overseas countries. Faculty of trained specialists. Modern laboratories and equipment.

Write for free 110-page catalog, 48-page pictorial booklet "Your Career" and "Occupational Guidance Bulletins."

## MILWAUKEE SCHOOL OF ENGINEERING

NONPROFIT • FOUNDED IN 1903



Milwaukee School of Engineering  
Dept. RE-153, North Milwaukee  
Milwaukee 1, Wisconsin

Without obligation send Catalog for Electrical Engineering, B. S. Degree, major in ☐ Electronics; ☐ Power; ☐ "Your Career"; ☐ Occupational Guidance Bulletin on: ☐ Radio-TV; ☐ Electrical Power; ☐ Welding; ☐ Heating; Refrigeration, Air Conditioning; ☐ Mechanical Engineering, B. S. Degree; ☐ Preparatory; ☐ Television Service.

Name.....Age.....

Address.....

City.....Zone.....State.....

If veteran, indicate date of discharge.....



# NEED ANY TUBES?

Make Barry your source for FAST-DELIVERY on all types. We carry all the standard brands. All tubes individually cartoned and carry Standard RMA Guarantee.

Tube Orders Over \$8.00 with full remittance Prepaid To You in USA.

Prior to shipment, all tubes INDIVIDUALLY retested (not just checked) on our Hickok Mutual-Conductance Tube-Testers to insure you 100% perfect merchandise. For your maximum money's worth, buy in full confidence from TUBE SPECIALISTS. Here you get only a partial listing of our large stocks. You may order types not listed at approx. same savings.

0A2	...	\$.95	6AT6	...	.63	12H6	...	.75
0B2	...	1.10	6AU6	...	.59	12SA7	...	.75
0C3/VR105	...		6AV6	...	.55	12SF5	...	.70
	...	1.19	6AX4GT	...	1.10	12SG7	...	.87
0D3/VR150	...		6BC5	...	.63	12SH7	...	.95
	...	.95	6BE6	...	.45	12SJ7	...	.69
0Z4	...	.59	6BG6-G	...	1.39	12SK7	...	.75
1A7GT	...	.89	6CA	...	.49	12SL7	...	.75
1A4	...	.90	6CB6	...	.45	12SN7GT	...	.84
1B3GT	...	.81	6CD6-G	...	1.55	12BT-M	...	.75
1H5GT	...	.69	6F6-M	...	.69	14F7	...	.80
1NSGT	...	.74	6F8-G	...	.89	19AP4A	...	40.00
1L4	...	.60	6G6-G	...	.95	25AV5	...	1.25
1LA6	...	.90	6J5GT	...	.49	25B06-GT	...	.79
1N21-B	...	2.95	6J6	...	.57	25L6GT	...	.64
1N23-A	...	2.25	6J7	...	.75	35B5	...	.40
1N23-B	...	3.49	6K6-GT	...	.59	35C5	...	.60
1N34	...	.64	6K7-M	...	.70	35L6	...	.49
1N34-A	...	.75	6L5-G	...	.49	35Z5GT	...	.49
1N44	...	1.21	6L6-G	...	1.19	42	...	.65
1N45	...	1.39	6L7	...	.98	50C5	...	.50
1N48	...	.55	6N7-M	...	.95	50L6-GT	...	.65
1N54	...	.89	6Q7-GT	...	.80	117Z6	...	1.00
114	...	.49	6S7-M	...	.98	304-TH	...	7.00
1X2A	...	.95	6SD7	...	.79	304-TL	...	8.75
2B7	...	.75	6SG7	...	.88	717-A	...	.98
2D21	...	1.35	6SH7	...	.64	805	...	2.50
2E24	...	2.75	6SJ7-GT	...	.69	807	...	1.59
2E30	...	2.19	6SJ7-M	...	.70	811	...	2.95
3A4	...	.59	6SK7-GT	...	.60	811-A	...	3.50
3D6/1299	...	.50	6SL7-GT	...	.60	332-A	...	8.50
3Q4	...	.49	6SN7-GT	...	.75	837	...	1.45
3Q5GT/G	...	.99	6SQ7	...	.65	866-A	...	1.55
354	...	.80	6T8	...	.75	GE872-A	...	3.75
5F7P	...	1.95	6U4-GT	...	.65	1280	...	.80
5R4GY	...	1.29	6V6-GT	...	.57	1613	...	.75
5U4-G	...	.55	6W4-GT	...	.57	1614	...	2.00
5V4-G	...	1.10	6X5-GT	...	.52	1616	...	.74
5X4-G	...	.79	7A6	...	.65	1622(6L6)	...	1.95
5Y3-GT	...	.43	7A8	...	.75	1625	...	.40
6A84	...	.75	7C7	...	.80	1629	...	.30
6A87	...	.98	7F7	...	.74	1631	...	1.50
6AC7	...	.94	7H7	...	.80	1632	...	.70
6AG5	...	.65	12A6	...	.65	2050	...	1.48
6AG7	...	1.25	12A7	...	.72	5516	...	5.95
6AH6	...	1.00	12AU7	...	.69	5654	...	2.00
6AJ5	...	1.75	12AV6	...	.53	5692	...	7.95
6AK5	...	.74	12BA6	...	.69	5910	...	.75
6AL6	...	.54	12BA7	...	.90	5910	...	.75
6AN5	...	2.25	12BD6	...	1.23	9001	...	1.35
6AQ5	...	.55	12BE6	...	.45	9002	...	.75
6AR6	...	2.75	12C8	...	.79	9004	...	.39

## CBS-HYTRON CATHODE RAY PICTURE TUBES

First Quality in factory-sealed cartons. Full Year Warranty Card on each tube. Remember... Cheap prices mean Seconds or Rebuilds. Prices include Fed. Tax. C.R. Tubes 1a Express Collect. 71P4...18.75 17BP4A...24.75 21EP4A...38.50 10BP4A...21.00 17HP4...25.50 And other Hytron 16RP4...30.00 20CP4A...36.50 types stocked

## SELENIUM RECTIFIERS

Full-Wave Bridge Types

Current (Continuous)	18/14 Volts	36/28 Volts	54/42 Volts	130/100 Volts
1 Amp.	\$1.35	\$2.15	\$3.70	\$7.50
2 Amps.	2.20	3.60	5.40	10.50
2 1/2 Amps.	...	...	6.00	13.00
4 Amps.	3.75	6.75	10.25	...
5 Amps.	4.25	7.95	12.95	25.25
6 Amps.	4.75	9.00	13.50	33.00
10 Amps.	6.75	12.75	20.00	40.00
12 Amps.	8.50	16.25	25.50	45.00
20 Amps.	13.25	25.50	39.00	79.50
24 Amps.	16.25	32.50	45.00	90.00
30 Amps.	20.00	38.50	...	...
36 Amps.	25.00	48.50	...	...

## New Selenium Rectifier Transformers

PRI: 115 V. 60 cycles in. 4 Amps. .... \$ 8.75  
SEC: 9, 12, 18, 24, and 36 } 12 Amps. .... 16.75  
volts } 24 Amps. .... 35.75

Made to our specs. for continuous, heavy-duty use

- 115V. PRI-18V. @ 2 amps. XFMR. .... \$2.75
- 115V. PRI-33V. @ 55 amps. sec. XFMR. .... \$39.95
- 115V. PRI-33V. @ 130 Amp. SEC. .... \$59.95
- 115/230 V. 60 cy. PRI. SEC.: 1.5, 30.3, 33.5, and 36.5V. @ 4 AMPS. Herm. Sealed. .... \$6.50

• New Selenium Rectifier Chokes  
4 Amps.—.07 hyf.—6 ohm ..... \$7.95  
12 Amps.—.01 hyf.—1 ohm ..... \$14.95  
24 Amps.—.004 hyf.—.025 ohm ..... \$29.95

We can manufacture other Selenium Rectifiers, Selenium Rectifier Supplies, XFMRs., & Chokes. Write

• Biley-Type SMC-100—Crystal Standards. 100 KC and 1,000 KC Bar ..... New \$8.50

• AR-11—Complete Station for 20, 40, or 80 meters. Superhet Rcvr.—50 Watts CW w/built in 115 V.A.C. Pwr Supply. New—in compact suitcase (orig. cost over \$500). Tuning eye for only ..... \$99.50

• Western Electric Marine 4-Channel Radiotelephone Sets. Brand New—Write for full details—

**BARRY ELECTRONICS CORP.**

136 Liberty Street, N.Y. 6, N.Y. Rector 2-2562  
Terms: 25% with order, balance C.O.D.—Send a few cents for postage—All merchandise guaranteed. F.O.B. N.Y.C. "Please, minimum order \$2".

## ADVERTISING INDEX

Adelman, Nat	179
All Channel Antenna	129
Alliance Mfg. Co.	26
Allied Radio Corp.	13
American Electrical Heater Co.	124
American Electronics Co.	137
American Phone Corp.	142
Amplifier Corp. of America	118
Arkey Radio Kits, Inc.	164
Asatic Corp.	178
Audel Publisher	6
Barry Electronics	178
Bell Telephone Labs.	163
Bendix Radio	179
Blonder-Tongue Labs.	128
Brook Electronics, Inc.	176
Brooks Radio & TV	137
Buchan Co., Richard J.	110
Burstein-Applebee Co.	164
Candle System Co.	3
Capitol Radio Engineering Institute	21
Centralab—Div. of Globe Union	101
Channel Plaster Corp.	166
Cisin, H. G.	9
Cleveland Institute of Radio Electronics	171
Columbia Wire & Supply Co.	164
Commissioned Electronics	138
Concord Radio	173
Cornell-Dubilier Electric Corp.	151
Coyne Electrical TV Radio School	113
Creighton Radio & Television School	113
Crest Laboratories, Inc.	8
Davis Electronics	181
De Cray & Associates	118
DeForest's Training, Inc.	7
DuMont Labs, Inc. Allen B.	176
Editors & Engineers	146
Edie Electronics	28
Electronic Instrument Co., Inc.	138
Electro-Voice, Inc.	139
Equipto	166
Federated Purchaser	173
Feiler Engineering Co.	155
Finney Co.	127
General Commercial Electric Co.	125
General Electronic Dist. Co.	154
General Test Equipment	160
Goodie, Inc., Don	147
Greylock Electronic Supply Co.	85-95 include
Halldorson Transformer Co.	114, 115, 159
Harvey Radio Co., Inc.	158
Hickok Electrical Instrument Co.	166
Hi-Lo TV Antenna	111
Hudson Radio & TV Corp.	132
Hughes Research & Development Labs	133
Hytron Radio & Electronics Corp.	158
Indiana Technical College	11
Instructograph Co.	130
Insuline Corporation of America	141
International Correspondence Schools	120
IPD Manufacturing Co., Inc.	16
Jackson Electrical Instrument Co.	109
Jan Electronic Distributing Co.	173
Jersey Specialty	152
Jones & Laughlin Steel Corp.	172
Krylon, Inc.	179
LaPointe-Plaster Corp.	159
Leotone Radio Corp.	152
Leutz, Charles Roland	172
Macmillan Co., The	179
Mallory & Co., Inc. P. R.	159
Mattison Television & Radio Corp.	173
McGraw-Hill Book Co.	140
Merrill Co. & Transformer Co.	121
Michel Manufacturing Co.	118
Miles Reproducer Co., Inc.	19, 20
Miller Co. J. W.	168
Mosley Electronics	170
Moss Electronic Distributing Co., Inc.	132
National Electronics of Cleveland	166
National Plans Co.	127
National Radio Institute	174
National School of Electronics	127
Neal Electronic Co.	127
Oak Ridge Products	164
Opportunity Advertisers	166
Perma-Power Co.	167
Pickering	174
Plastid Corp.	127
Platt Electronics Corp.	174
Precise Development Corp.	127
Precision Asstratus Co., Inc.	139
Prentice-Hall, Inc.	164
Pres-Probe Co.	166
Progressive Electronics	133
Quam-Nichols Co.	15
RCA Institutes, Inc.	Back Cover
RCA Victor Division (Radio Corporation of America)	162
Radiant Corp.	119
Radiotronics Corp.	158
Radio Merchandise Sales, Inc.	
Radio Receptor Co., Inc.	

## RADIO SCHOOL DIRECTORY PAGE 177

Electronics Institute, Inc.	RCA Institutes
Indiana Technical College	Tri-State College
Martin School, Don	Valparaiso Tech. Inst.
Milwaukee School of Eng.	Western Television Inst.
YMCA Trade & Technical School	
Radio-Television Training Assn.	24
Ram. Electronics Sales Co.	170
Rauland Corp., The	14
Raytheon Manufacturing Co.	23
Regency Div. (I.D.E.A., Inc.)	148
Rek-O-Kut Co.	150
Rider, Inc., John F.	100, 133, 156, 122, 163
Rinehart Books, Inc.	168
Rose Co.	144
Ryfel Electronic Manufacturing Co.	112
Sams & Co., Inc., Howard W.	18, 118, 152
Sangamo Electric Co.	116
Schoff Co., Walter L.	104
Service Instrument Co.	187
Simpson Electric Co.	135, 141
Skyline Manufacturing Co.	172
Soundronics Labs., Inc.	154
Sprague Products Co.	105
Sprayberry Academy of Radio	83
Stan-Burn Radio & Electronics Co.	156
Standard Transformer Corp.	136
Steve-El Electronics Corp.	160
Suprem Publications	145, 156
Sylvania Electric Products	162
TV Products Co.	162
Talbot Company, Inc.	170
Tech-Master Products	185
Technical Appliance Co.	167
Tei-Ray Enterprises, Inc.	150
Telematic Industries, Inc.	171
Telesound Corp.	149
Television Communications Institute	17
Television Materials, Inc.	159
Telrex, Inc.	97
Thomas Mold & Die Co.	159
Transcriber Co., The	147
Transvision, Inc.	157
Triad Transformer Manufacturing Co.	174
Triplet Electronic Instrument Co.	123
Triumph Electric Co.	10
Turner Co., The	12
United Catalog Publishers	134
University Loudspeakers	175
Utah Radio Products Co.	140
Vaidare Television Co.	151
Ward Products Corp.	27
Wells Sales	117
Westinghouse Electric Corp.	162
Wholesale Radio Parts Co., Inc.	126
Wiley & Sons, Inc.	169
Wincharger Corp.	

Radio-Electronics does not assume responsibility for any errors appearing in above index.

## WHEN YOU ORDER

# WELLS COMPONENTS...



## HERE'S WHAT YOU GET

- 1 IMMEDIATE DELIVERY FROM STOCK (in any quantity)
- 2 FINEST QUALITY OF FAMOUS BRANDS
- 3 GENERALLY LOWER PRICES
- 4 RETURN PRIVILEGE FOR FULL CREDIT IF NOT SUITED TO YOUR REQUIREMENTS

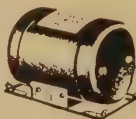
The valuable service Wells provides to the industry is being used by many of our greatest manufacturers as a matter of course.

Our vast stock (the world's largest) may contain just the components you need to fill urgent orders — at a substantial savings in time and cost.

ADEL CLAMPS • ANTENNAS, Insulators, Mast Sections • BINDING POSTS • BLOWERS • CABLE ASSEMBLIES • CHOKES • COILS • CONDENSERS Oil Filled, Bathub, Hearing Aid, Transmitting Micars, Silver Micars, Ceramic, Variable, Trimmer • CRYSTALS • FILTERS • FUSES & MOUNTINGS • GENERATORS • GROUND RODS • HEADSETS • I.F. COILS • JACKS • JACK BOXES • KEYS, Telegraph KNOBS • LAMPS • LORD MOUNTS • LUGS MOTORS & BRUSHES • PLUGS • RECTIFIERS Selenium, Copper Oxide, Meter, Diode • RESISTORS—All Types • SELSYNS • SOCKETS • SWITCHES Aircraft, Micro, Switchettes, Toggle • TIMERS • TUBING—Flexible • TUNING SHAFTS • TRANSFORMERS All Types • VIBRATORS • WALKIE TALKIES

## DYNAMOTORS

OVER 100,000 NEW DYNAMOTORS IN STOCK!



DM 32A — DM 53A — PE 86 — PE 101C  
DM 33A — D 101 — PE 94, etc.

Large quantities of brushes for all types of dynamotors and motors.

Write us for quotations. Advise us your requirements.

A complete Signal Corps stock number listing of items in our stock. Write for listing No. 5G-200. (For government agencies and contractors only.)

Manufacturers and distributors—write for new Condenser Catalog C-10 now available.

Write, Wire, Phone Your Requirements all phones: SEeley 8-4143

**WELLS SALES, INC.**

833 W. CHICAGO AVE., DEPT. 2, CHICAGO 22, ILL.

RADIO-ELECTRONICS



# TV ENGINEERS

(Experienced in TV Receiver & Broadcast Radio Design)

*Bendix Radio's Expansion Means Opportunity for You!*

A large expansion program in our Television Division means we have excellent openings for TV Receiver and Broadcast Radio Design Engineers. It means you have the chance to get in on the ground floor... an opportunity for rapid advancement.

At Bendix Radio, the work is interesting and challenging. There is work on chassis design and development on current sets; there is research in the field of color, U. H. F., etc.

At Bendix Radio, you work under ideal conditions in our modern, air-conditioned plant. You benefit from paid vacations and holidays, group insurance and many employee benefits... plus good living in the beautiful country and suburban areas that surround our plant.

Send résumé to  
Mr. E. O. Cole, Dept. T

**Bendix Radio**

DIVISION OF BENDIX AVIATION CORP.  
BALTIMORE-4, MD. Phone: TOWSON 2200

## TUBES Today's Best Buys

Top Quality at Terrific Savings  
RTMA Guaranteed

1A7GT .... \$ .79	6BF8 ..... \$ .68	12AT7 .... \$1.18
1B3 ..... 1.05	6BG6G .... 1.98	12AU6 .... .49
1L4 ..... .60	6BH8 ..... 1.00	12AU7 .... .90
1L6 ..... .60	6BJ6 ..... .85	12AV7 .... .95
1LN8 ..... .95	6BQ6 ..... 1.27	12AX7 .... .05
1T4 ..... .65	6C4 ..... .60	12BA6 .... .48
1U4 ..... .80	6CB8 ..... .65	12BA7 .... .80
1X2A ..... 1.05	6CD6G .... 1.93	12BE8 .... .55
3Q4 ..... .55	6J6 ..... .73	12K9 ..... .49
8U4G ..... .89	6K6 ..... .85	12SA7GT .... .70
5V4 ..... .95	6L6Q ..... 1.05	12SF8M .... .88
3Y3GT .... .49	6S4 ..... .71	12SJ7 .... .85
6AB4 ..... .80	6S7M ..... .85	12SJ7 .... .60
6AC7 ..... 1.10	6SA7GT .... .70	12SK7 .... .65
6AG8 ..... .90	6SGF ..... .75	12SQ7 .... .70
6AH8 ..... 1.40	6SK7GT .... .85	12SN7GT .... .75
6AK3 ..... .95	6SL7GT .... .88	12SR7 .... .65
6AK6 ..... 1.20	6SN7GT .... .88	14BE ..... .95
6AL3 ..... .75	6SQ7GT .... .85	19BG6G .... 1.98
6AQ3 ..... .79	6SR7M ..... .72	19T8 ..... 1.15
6AS5 ..... .79	6T9 ..... 1.15	25L6GT .... .85
6AT6 ..... .59	6V6GT .... .79	25W4 ..... .80
6AU8 ..... .79	6W6 ..... .85	35L6GT .... .65
6AV8 ..... .59	6W4GT .... .69	35W4 ..... .47
6BA8 ..... .75	6X4 ..... .49	35Z5GT .... .49
6BC3 ..... .79	6X5 ..... .59	50B5 ..... .55
6BE6 ..... .75	6Y6 ..... .85	50C5 ..... .53
6BF8 ..... .85	12AT6 ..... .59	50L6GT .... .85

Minimum Order \$15.00

IMMEDIATE DELIVERY!

Write for quotations, many other types available. 20% Deposit with order, balance C.O.D. All tubes subject to prior sale. Prices subject to change without notice.

WRITE, WIRE, CALL—TODAY!

We Buy Anything in Electronics—large or small Quantities!

**Nat Adelman**

168 Washington St. New York 6, N. Y.  
CO. 7-6091

lower frequencies. Then it proceeds with u.h.f. techniques and illustrates equipment.

One important chapter deals with transmission lines and how they are used as tuning elements, filters, and transformers. Waveguides are shown to be developed from lines. Other chapters deal with u.h.f. circuits and tubes. Butterfly circuits, travelling wave tubes, and others are included. An interesting chapter describes and illustrates several types of TV converters. Transmitters, test equipment, and h.f. measurements are also described in the book.—IQ

**FUNDAMENTALS OF ENGINEERING ELECTRONICS**, Second Edition, by William G. Dow. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 5 3/4 x 9 inches, 627 pages. Price \$8.50.

This book concentrates on tubes and semiconductors, rather than circuits. The level is suitable for college junior students. It is also well arranged for reference use. Physical explanations, and many illustrations and mathematical analyses are provided.

The first chapters establish basic principles of potential distribution, electron ballistics, and cathode rays. Then material is presented on fields within a tube, capacitance effects, tube characteristics, and thermionic cathodes. An important chapter describes electrons in metals and semiconductors to provide a good understanding of transistors, rectifiers, and photosensitive devices. There are also chapters on amplifiers, oscillators, and microwave tube types.

The remainder of the volume explains phenomena within gas tubes and photo-sensitive devices. Arcs, glow tubes, and gas rectifiers are illustrated and described in the final chapters.—IQ

**ELECTROMAGNETICS** by Robert M. Whitner, published by Prentice-Hall, Inc., New York, N. Y. 5 1/2 x 8 1/4 inches, 270 pages. Price \$6.65.

This is a book for engineering students. It emphasizes field theory and prepares the reader for a good understanding of fields and waves. A knowledge of calculus is required. It introduces the reader to vectors, after which this type of analysis is used freely. The mathematical treatment is effective and clear.

The first chapter describes charge, field and potential. Then electrostatics, d.c., magnetics, and a.c., are discussed in turn. The author shows the meaning and application of gradient, divergence, curl, and other concepts. Later chapters derive Maxwell's equations and other important laws. Advanced topics relating to fields and waves are covered in the final chapters.

Each chapter ends with a series of problems.—IQ

END

**TV CONSULTANT**, by Harry G. Cisin, was reviewed in the November issue under the erroneous title: "Rapid Trouble Shooting and Alignment." Our apologies to Mr. Cisin for the error.

You can be  
sure you'll pass  
your FCC exams

Use the question-and-answer guide that's given passing scores to countless men for twenty years

New 11th Edition Just Out!

## RADIO OPERATING QUESTIONS AND ANSWERS

By J. L. Hornung

Hopkins Engineering Company  
and Alexander A. McKenzie  
Associate Editor, *Electronics*

545 pages, 139 illustrations, over 1900 answers, \$6.00

IF YOU had taken your first FCC exam back in 1921, the heavy odds are you'd have gotten ready for it by studying the first edition of Hornung's book (then it was the famous "Nilson and Hornung's Questions and Answers"). It helped thousands then; it's since gone through ten editions that have kept the fast pace of changes in FCC requirements and big advances in the field.

Now comes the new eleventh edition... brought up to date to follow the new FCC study guide question for question... arranged by topics so that it's easy to study, handy for reference... built for lasting value by showing you how to keep up with month-to-month changes.

In this book you get a full, accurate "passing" answer to every question in the FCC Study Guide—an answer so complete that, no matter how the question is phrased on the exam, you will be able to get it right.

What you get in the new edition of this long-popular and proved book:

Answers to all questions suggested for study in the FCC "Study Guide and Reference Material for Commercial Radio Operator Examinations, Revised February 1, 1951." The book gives complete specific information on radio law, operating practice, and theory—for commercial radio operator examinations of all the various license grades.

Coverage of every element in the FCC exams, including the advanced ones of element 7 (aircraft radio-telegraph) and element 8 (ship radar).

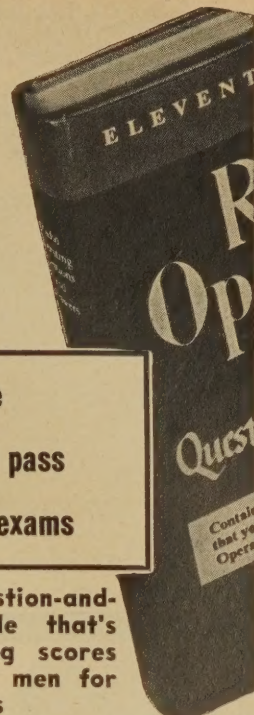
The newer Q-codes for special purposes, time-signal information, word lists, and the like.

New material covering changes in the law, radar, and operating practice, particularly as it applies to the newer mobile services (offer good in U.S. only).

— SEE THIS BOOK 10 DAYS FREE —

McGraw-Hill Book Co., 327 W. 41 St., NYC 36  
Send me Hornung and McKenzie's RADIO OPERATING QUESTIONS AND ANSWERS for 10 days' examination on approval. In 10 days I will remit \$6.00, plus a few cents for delivery, or return the book postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

Name.....  
Address.....  
City..... Zone..... State.....  
Position..... RE-1







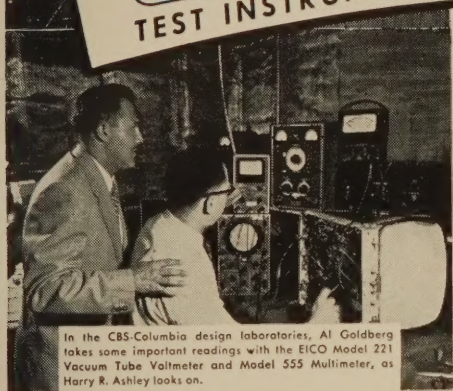


# EICO

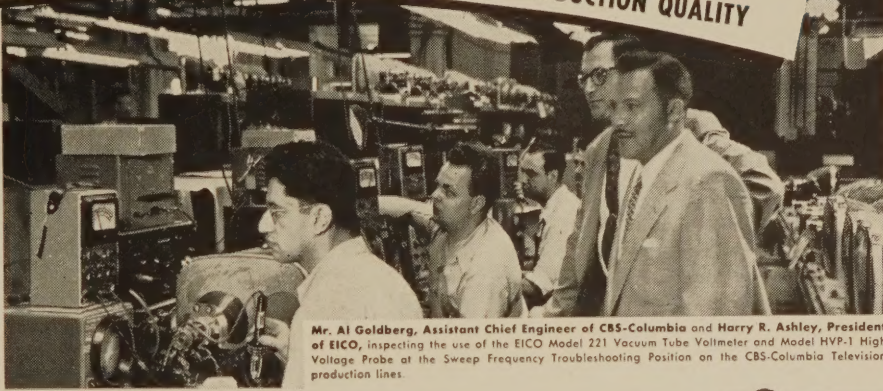
TEST INSTRUMENTS

# GUARDS CBS

High Standards of  
TELEVISION PRODUCTION QUALITY



In the CBS-Columbia design laboratories, Al Goldberg takes some important readings with the EICO Model 221 Vacuum Tube Voltmeter and Model 555 Multimeter, as Harry R. Ashley looks on.



Mr. Al Goldberg, Assistant Chief Engineer of CBS-Columbia and Harry R. Ashley, President of EICO, inspecting the use of the EICO Model 221 Vacuum Tube Voltmeter and Model HVP-1 High Voltage Probe at the Sweep Frequency Troubleshooting Position on the CBS-Columbia Television production lines.

## KITS-Wired Instruments

For Laboratory Precision at Lowest Cost—  
the Leaders Look to **EICO!**

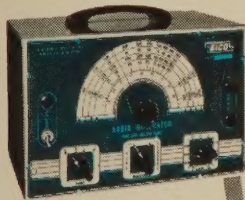
**WHY** does CBS-Columbia, Inc., one of America's great headline-makers in Television set production, use EICO Test Instruments on both its new Television production lines and in its design laboratories?

**BECAUSE** like Emerson, Tele-King, Teletone, Majestic, and many another famous TV manufacturer coast to coast, CBS-Columbia knows that

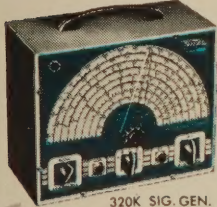
- ONLY **EICO** TEST EQUIPMENT DELIVERS ALL 10 **EICO** NOMICAL FEATURES
1. Laboratory Precision
  2. Lowest Cost
  3. Lifetime Dependability
  4. Speedy Operation
  5. Rugged Construction
  6. Quality Components
  7. Latest Engineering
  8. Super-Simplified Assembly and Use Instructions
  9. Laboratory-Styled Appearance
  10. Exclusive EICO Make-Good Guarantee

Before You buy any higher-priced equipment, be sure You look at the **EICO** line—in *Wired* as well as *Kit form*! Each **EICO** product is jam-packed with unbelievable value. **YOU** be the judge—compare, see **EICO** instruments today—in stock at your local jobber—and **SAVE 50%!** Write NOW for **FREE** newest Catalog 1-C.

**FOLLOW THE LEADERS...INSIST ON EICO!**

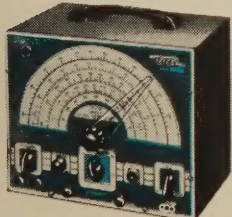


**NEW** 377K SINE & SQUARE WAVE AUDIO GEN. KIT \$31.95. WIRED \$49.95

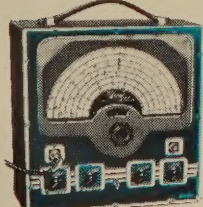


320K SIG. GEN. KIT \$19.95. WIRED \$29.95

322K SIG. GEN. KIT \$23.95. WIRED \$34.95



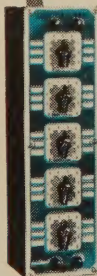
360K SWEEP GEN. KIT \$34.95 WIRED \$49.95



315K DELUXE SIG. GEN. KIT \$39.95 WIRED \$59.95



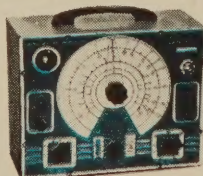
1040K BATTERY ELIM. KIT \$25.95 WIRED \$34.95



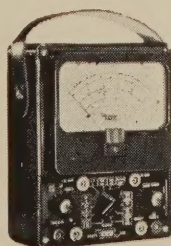
1171K RES. DECADE BOX KIT \$19.95 WIRED \$24.95



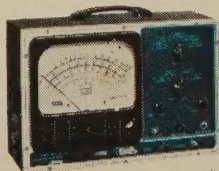
**NEW** 536K MULTIMETER KIT \$12.90. WIRED \$14.90. 1000 OHMS/VOLT



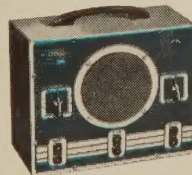
950K R-C BRIDGE & R-C L COMP. KIT \$19.95 WIRED \$29.95



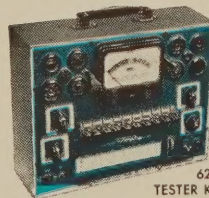
**NEW** 565K MULTIMETER KIT \$24.95. WIRED \$29.95. 20,000 OHMS/VOLT



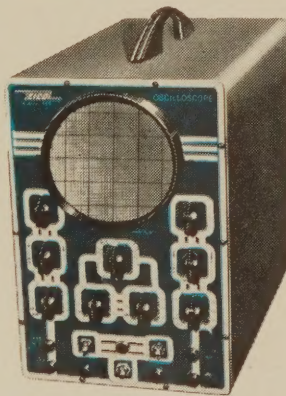
**NEW** 214K VTVM KIT \$34.95. WIRED \$54.95. 7 1/2" METER



145K SIG. TRACER KIT \$19.95 WIRED \$28.95



625K TUBE TESTER KIT \$34.95 WIRED \$49.95



425K 5" PUSH-PULL SCOPE KIT \$44.95. WIRED \$79.95



HIGH VOLTAGE PROBE \$6.95



221K VTVM KIT \$25.95 WIRED \$49.95



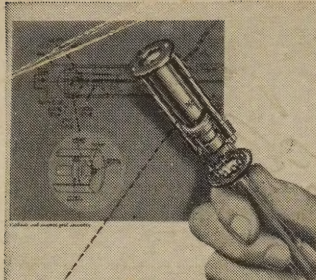
CRA PIX TUBE ADAPTOR for Tube Tester \$4.50

AMERICA'S GREATEST INSTRUMENT VALUES BEAR THE NAME—

# EICO

ELECTRONIC INSTRUMENT CO., INC.  
84 Withers Street, Brooklyn 11, N. Y.

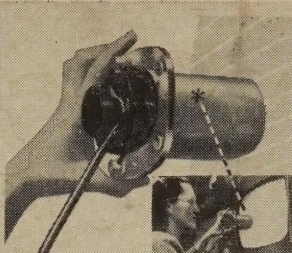




The gun that looked 100% "perfect"  
... yet never "fired a shot"

[illegible]

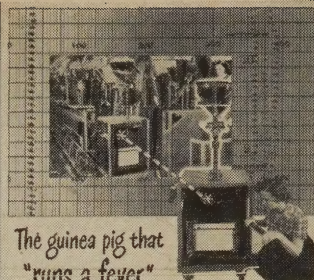
**RADIO CORPORATION of AMERICA**  
FLYING WINGS      NEW YORK, N. Y.



How we **SPOT** "shady characters"  
before they can damage your business


[illegible]

**RCA** RADIO CORPORATION OF AMERICA



The guinea pig that  
"runs a fever"

to bring you better picture tubes

[illegible]
**RADIO CORPORATION of AMERICA.**

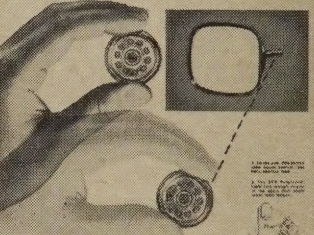
**99.99%** pure phosphor...  
yet we throw it away

[illegible]

**RCA** **RADIO CORPORATION OF AMERICA**  
ELECTRON TUBES      BARRINGTON, N. J.

*The evidence is clear...*

**RCA safeguards your reputation...**  
**with tubes of unequalled quality**



**A DOUBLE-TAKE**  
to safeguard your reputation

[illegible]
**RADIO CORPORATION of AMERICA**  
 ELECTRON 16-222 HARRISON, N. J.

**In RCA Tubes and Kinescopes**  
*the difference is top-quality*

**RADIO CORPORATION of AMERICA**

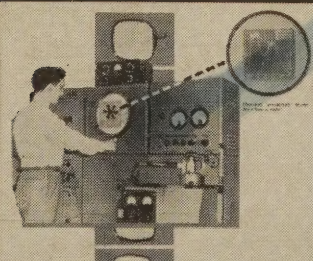
## ELECTRON TUBES

**HARRISON, N. J.**

TMK.®



**The Torture Chamber**  
that tests the strength  
of RCA Picture Tubes

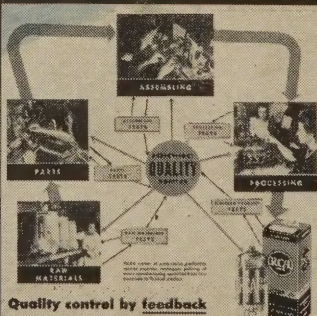


How we get *white* — that's just right

for RCA picture-tube screens

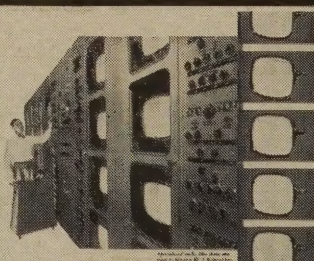
[illegible]

RADIO CORPORATION OF AMERICA



### Quality control by feedback

...the secret of RCA tube performance


**RADIO CORPORATION of AMERICA**

**The Million-Dollar Test Equipment**  
... that pays off in better picture tubes

As the program grows, public officials in other countries are increasingly turning to the United States for equipment valued at \$100,000 or more. The program has been successful in some ways. But it has problems too. On the low end, there are fewer than 100 users.

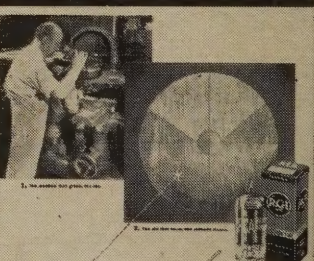
It has placed the responsibility for program coordination mostly on private contractors directly from the State

Department and obligated to figure out the way to make it work. They agree. But American-made private goods manufacturers in the United States are not interested in the program, says a government official. They are not interested in the way equipment is purchased for direct service in the field.

As the program matures at all stages of implementation, it must

grow. But needs specialists like equipment from the States. In the end, the U.S. needs specialists in the equipment and the way to use it.

With it, a growing number of users and contractors, the program will be able to grow, the officials say.

 **RADIO CORPORATION of AMERICA**

Take a look at **quality** being born

DOMESTIC ANIMALS of the Middle East in a vast range of species are under pressure from a combination of human and natural forces. And, as the world's population grows, the pressure will increase.

Wild game has been the main source of a special carbohydrate, glucose, for use as a sweetener in the making through its juices of "jams" called "jamun" which contain a form of glucose called "jamun sugar" and are used in the making of sweets and confectionery. The jamun is a small tree, 10 to 15 feet high, with a spreading canopy. The fruit is a small, round, greenish-yellow berry, about the size of a cherry.

Wild game has been the main source of a special carbohydrate, glucose, for use as a sweetener in the making through its juices of "jams" called "jamun" which contain a form of glucose called "jamun sugar" and are used in the making of sweets and confectionery. The jamun is a small tree, 10 to 15 feet high, with a spreading canopy. The fruit is a small, round, greenish-yellow berry, about the size of a cherry.

Wild game has been the main source of a special carbohydrate, glucose, for use as a sweetener in the making through its juices of "jams" called "jamun" which contain a form of glucose called "jamun sugar" and are used in the making of sweets and confectionery. The jamun is a small tree, 10 to 15 feet high, with a spreading canopy. The fruit is a small, round, greenish-yellow berry, about the size of a cherry.

**RADIO CORPORATION OF AMERICA**